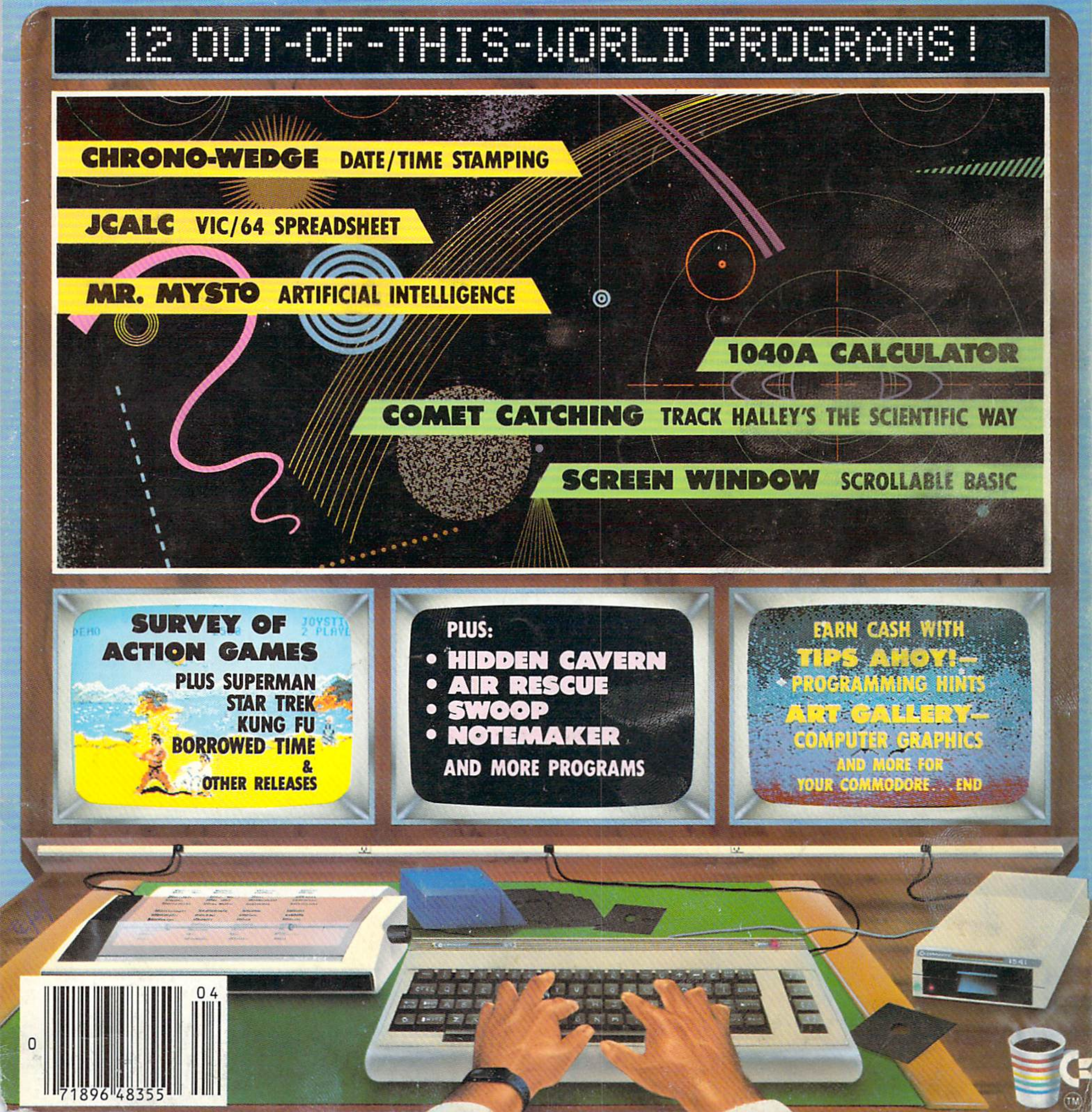
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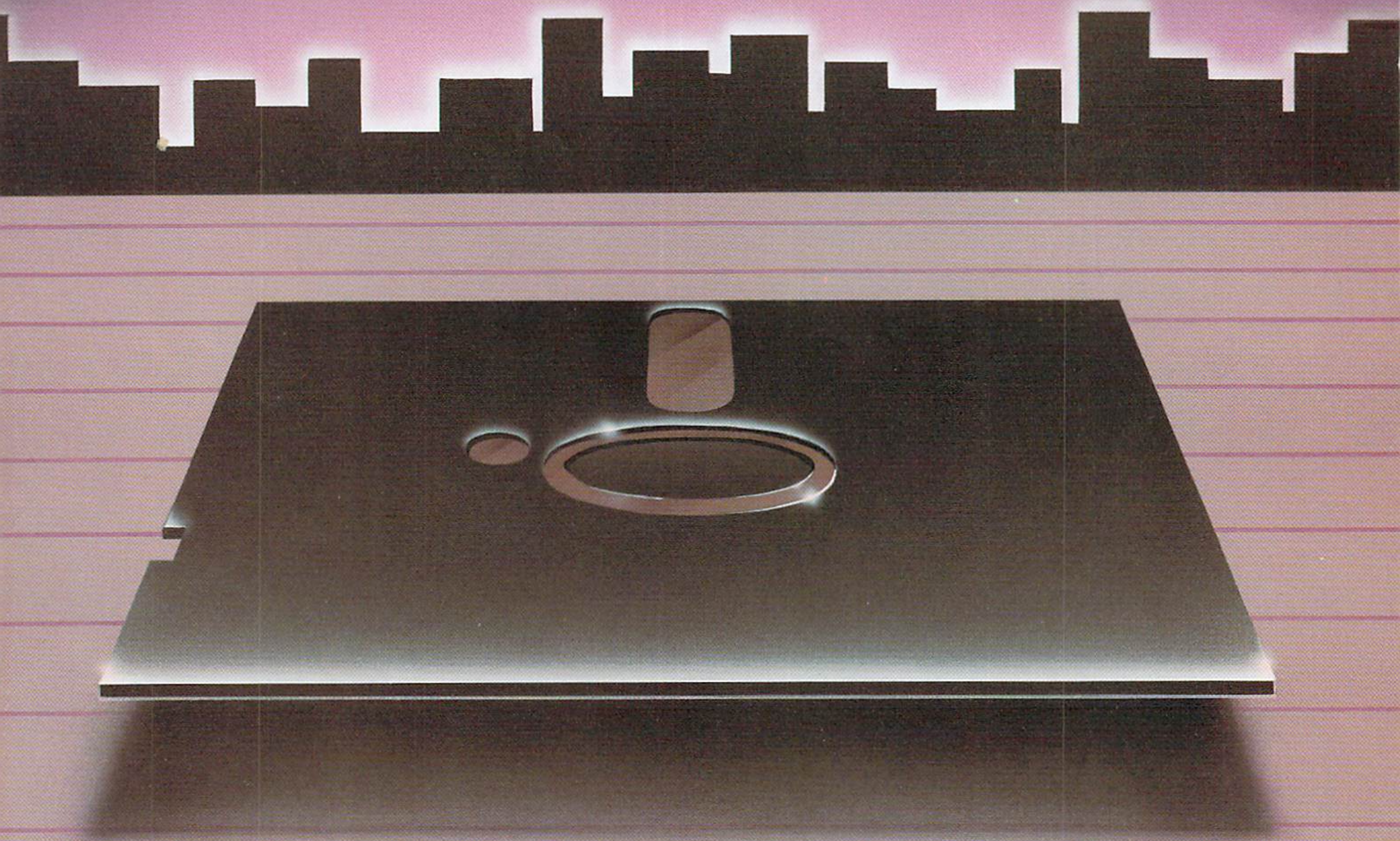
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CONTENTS

DEPARTMENTS

FEATURES

*Includes programs: *Comet Catcher* for the C-128 and C-64 and *Bitmapper* for the C-64
**Includes program: BIGCHRS for the C-64
***Includes program: *1040A Calculator* for the C-64, C-128, VIC 20, and Plus/4

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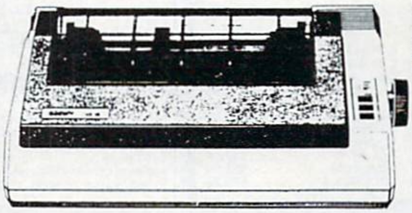
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VIEW FROM THE BRIDGE

This issue of *Ahoy!*, as our cover proudly boasts, contains 12 programs. We wish we could publish 20, or 50, but don't have the magazine pages to do so. As a partial solution to this problem we will continue the practice we began last month—to include additional, lengthy programs on our monthly disk that are not included in the magazine.

And what a bonus program we have for you this month! In his review on page 46, Arnie Katz calls *Actionauts* "the best (computer) game ever offered for free." We're sure you'll agree when you play the latest opus from the author of *Demon Attack*. (For information on ordering this month's *Ahoy!* disk, see page 60.)

As for the outstanding programs that *are* to be found in our back pages:

This month, Dale Rupert stops doing what he's been doing in the pages of *Ahoy!* since its first issue: provide new, unthought-of applications for Commodore 64 users. Beginning this issue, he'll be doing the same for 64 *and* 128 users! His *Rupert Report* on *Comet Catching* will enable you to simulate the motion of one object around another in space. (Turn to page 18.)

Just in time for taxes comes the *1040A Calculator*, Cheryl Peterson's useful program for the C-64, C-128, VIC 20, and Plus/4, included as part of this month's *Cadet's Column* on *Tax Time*. (Turn to page 97.)

If you need a little more computing power to prepare your taxes or manage your finances, *JCALC* provides it. Jeff Balvanz's spreadsheet for the C-64 or VIC 20 (with 8K expansion) performs the most essential functions of full-fledged commercial programs. (Turn to page 28.)

Back in May '85, Dennis Muscatelli contributed *DOS Plus*. His *Chrono-Wedge* in this issue could as well be titled *DOS Plus Plus*—because in addition to normal wedge functions, it provides date and time stamping for your programs. (Turn to page 61.)

Call it artificial semi-intelligence, or semi-artificial intelligence—but Frank DiNunzio's *Mr. Mysto* will amaze all those around you with its ability to "read minds" and perform other, more practical applications. (Turn to page 36.)

Screen Window by Mike Grotton makes it possible to page up and down through your BASIC program listings. A search function is also provided. (Turn to page 54.)

Notemaker by Tim Gerchmez will let you document a program with autobooting disk notes. (Turn to page 51.)

For generating a printout of a machine language program without need of a machine language monitor, Gordon F. Wheat offers the *Flankspeed Listing Creator*. (Turn to page 51.)

If you find the listing for *Air Rescue* torn out of this issue, it's probably because the evil Count Mordo got to the newsstand before you. He'll do anything to keep you from carrying the citizens of Kernalville to safety! (Turn to page 35.)

But if you can't help them, kiss them off. You'll be busy enough saving yourself from the Cave Globs in James C. Hilty's *Hidden Cavern*. (Turn to page 57.)

Like his *Knockout* in our January '86 issue, Tony Brantner's *Swoop* features simple but engaging graphics and first-flight gameplay. (Turn to page 53.)

Short of committing an axe murder, what chance does the average assembly language programmer have of *Making Headlines?* Plenty—because BIGCHRS, presented as part of Mark Andrews' ongoing *Commodore Roots* series on redefining the C-64's character set, will let you generate giant-size characters with ease. (Turn to page 92.)

Our *Entertainment Software Section* continues its macroscopic view of the C-64 software market with *Think Fast!*, a survey of action and strategy games for the C-64. Also included are reviews of *Panzer Grenadier, Superman, Gamemaker,* and other recent releases. (Turn to page 41.)

In response to the greatest reader demand in our two and a half year history—yes, Morton Kevelson *will* apply his acclaimed inside-out reviewing technique to Commodore's Amiga in the pages of *Ahoy!* Watch for this major feature as early as our June issue. —**David Allikas**

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WINTER '86 CONSUMER ELECTRONICS SHOW—SATELLITE DISH, ANYONE?

We don't go to trade shows with the intention of bringing bad news back to you. Yet the analysis of the Winter '86 Consumer Electronics Show that you're about to read will remind you of the way September '85's *Scuttlebutt* section began—with a gloomy outlook on the future of the home computer market. The only difference is that the trouble signs that manifested themselves at last summer's CES have come to full fruition.

We wish we could be optimistic. After all, it's just your hobby that's in danger. It's our jobs.

But what grounds for optimism could be found in an exhibition, traditionally the showcase of the latest trends in home electronics, in which computers and computer software played their smallest role since before the introduction of the Commodore 64? In September we mentioned that the *Wall Street Journal* had described the computer software section of last summer's CES as a ghost town. At January's CES, there *was* no computer software section—just a couple of dozen booths scattered among the satellite dishes and video manufacturers in the West Hall of the Las Vegas Convention Center (at previous shows, devoted primarily to software).

The larger Main Hall, home to the sprawling exhibits usually presented by companies like Epyx and Broderbund, hosted only a handful of software companies, offering exhibits considerably scaled down from their usual pageantry. We won't list the vendors that showed and the vendors that didn't, those that put on the dog and those that made a token appearance. Such information is by itself meaningless; a company that skipped the show may have done so for reasons other than lack of funds, and one that attended may have scraped together its last few promotional thousands to do so. Suffice to say that if we made such a list, the well-known software purveyors who didn't attend would far outnumber those that did.

> **"(Commodore's) pulling out of CES seemed impossible, incongruous—like Russia resigning from the Soviet Bloc..."**

But it's vital that we make note of one comany that didn't show. . .and one that did.

Imagine our surprise when Commodore's public relations agency phoned us two days before CES to invite us to visit them—in their hotel suite. Understand that the last four CES shows in a row, dating back to January 1984, Commodore's exhibit had been the focal point of the home computer segment of CES, the most-visited computer booth at the show—as befitted the industry's leading hardware manufacturer. Their pulling out of CES seemed impossible, incongruous—like Russia resigning from the Soviet Bloc, like Sly leaving the Family Stone.

But with open minds we went to Commodore's suite in the Las Vegas Hilton. What we saw sent us away with mouths agape—a pair of C-64 setups, displaying two products developed for the 64 by third party manufacturers (see below). No new Commodore releases (with the semi-exception of a 3½" disk drive being used to power one of the 64's, not officially announced at the show).

Which is not to say that Commodore should have released something new simply for the sake of CES. But not making a showing of any kind shook the confidence of the many Commodore dealers in attendance. We know because we spoke with more than a dozen of them. And it shook the confidence of the third party Commodore software developers in attendance. We spoke with every last one of them, which wasn't hard. Why, retailers and manufacturers alike asked, didn't Comodore do what Atari did at last summer's CES? Though Atari had no new releases to speak of, they rounded up a number of third party manufacturers who had ST software under development and housed their wares under the Atari umbrella. It made for an impressive display. Certainly Commodore could have done the same with Amiga. Either they don't care about standing behind their machine, or are too broke to stand behind their machine—and in either case, why should I as a retailer bear the whole burden in trying to sell it? Or as a software manufacturer, run the risk of developing for it?

Casting Commodore in an even more unfavorable light by contrast

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was. . .want to guess? Coleco? No. TI? No. Want to guess again?

We admit that when Jack Tramiel took over Atari many months ago, we appreciated the irony, but weren't actually worried that the former Commodore CEO could rebuild the bankrupt company into a serious challenge to Commodore's leadership in the low-end market. But Jack, you sonuvagun. . .if you spoke to all the same people we spoke to at the show, you flew home to Sunnyvale without the benefit of an airplane. Many of the software companies in attendance told us they were planning releases for both the Atari 520ST and the Amiga. But a good number were going ST-only. Ditto for the retailers. Furthermore, judging from what we heard, it seems safe to say that the ST is outselling the Amiga by at least 3 to 1.

Fortunately for Commodore, the 128 is selling well. Well enough to prevent the need for the company to go Chapter 11, as Wall Street predicts? You'll read it in your daily paper long before these words reach you.

NEW GAMES

Psi-5 Trading Co. ($29.95) provides resumes and graphic depictions of 30 different characters, from whom the player as captain must select five for his crew. As his space freighter embarks on its mission to save the inhabitants of the Parvin Frontier from alien invaders, the captain interacts with his crew members (each of whom has his own skills and personality) through conversational text. A science fiction minidrama is thereby produced, its plot and outcome directly determined by the captain-crew relationship, particularly the player's skill in prioritizing tasks and delegating authority. For the C64.

During the first few months of 1986, dealers participating in the "Double Accolade" promotion will offer *Psi 5 Trading Co.* and *Law of the West* (see review in the February '86 *Ahoy!*) in a single package for $44.95.

Accolade, Inc., 408-446-5757 (see address list, page 130).

The third release in MicroProse's Command Series of real-time simulations, *Conflict in Vietnam* ($39.95) puts the armchair general in command of the crucial battles of the 20-year-long conflict. Elements unique to *Vietnam* include air strikes and artillery support, "airmobile" helicopter movement, and the cat and mouse tactics of guerilla warfare. Five different scenarios are included, playable in historic order from the French involvement through the fall of Saigon or independently. All action is controlled with basic keyboard or joystick commands.

MicroProse Simulation Software, 301-667-1151 (see address list, page 130).

The *Leader Board* golf simulator ($39.95) provides the player with a true perspective view of the game, as well as multiple 18-hold courses, 3D animation, and three levels of play. Other features include computerized scoring, handicap system, and strategy decisions involving choice of club, distance, and other variables.

Access Software, 801-298-9077 (see address list, page 130).

Sachs Enterprises has lowered the price of *Saucer Attack* from $26.50 to $19.50. See the advertisement on page 17 of our December '85 issue for a description of the game—and, yes, those *are* actual screen photos.

Sachs Enterprises, 714-337-2721 (see address list, page 130).

One of the biggest hits among CES software watchers was *The Pawn*, a graphic adventure coming from Firebird for the Amiga. Set in the reign of the mythical King Eric, it requires the player to travel to the land of Kerovnia to get a wristband taken off.



Psi-5 Trading Co. ***allows the player to select a five-member crew from over thirty applicants, each with his own strengths, weaknesses, and personality. READER SERVICE NO. 148***

Price will be about $44.95.

Firebird, 201-934-7373 (see address list, page 130).

Epyx will release *Winter Games, Rogue* and the *Temple of Apshai* trilogy in Amiga versions as early as March.

Epyx, Inc., 408-745-0700 (see address list, page 130).



The program helps the captain keep inventory of valuable commodities.

CURVEFIT-64

Designed to eliminate the tedium of finding formulas for data, *Curvefit-64* ($29.95) will develop mathematical models for a set of data by fitting X, Y data to 24 different curve types and sorting and displaying the results according to their "goodness of fit" values.

Nth Digit Solutions (see address list, page 130).

FREE BASIC BOOKLET

Learning BASIC with Voice Master, a 48-page booklet available for free from Covox Inc., teaches the student to record and play back digitized speech and make templates for word recognition using the Covox Voice Master (see *Speech Synthesizers for the Commodore Computers*, Dec. '85 *Ahoy!*). Lesson examples include a talking keyboard and cash register, listening and talking adding machine and language translator, and controlling outside events by voice. Math problems are avoided, with most examples directly illustrating practical speech input-output tasks.

Covox, Inc., 503-342-1271 (see address list, page 130).

SSSHHH...

The following new printers are available from Ergo Systems, Inc.:

The Hush 18 daisy wheel printer ($399.95) features 18 character per second (cps) speed, software selectable unidirectional and logic seeking bidirectional printing, proportional spacing at 1/120th inch increments, and the capability to handle paper up to 13" wide.

The Hush 120 ($299.95) prints at 120 cps in 80, 96, or 126 colums, with fixed and proportional character pitches, single and double resolution graphic modes, and eight foreign language character sets.

The Hush 80 S/R ($199.95) is the identical to the HUSH 80 CD portable thermal printer reviewed in our April '85 issue, except with a built-in rechargeable battery.

Ergo System, Inc., 415-363-5966 (see address list, page 130).

PRINT SHOP EXPANDER

How's this for a shrewd marketing strategy? Though their newly released newspaper layout program, *The Newsroom*, is in direct competition with Broderbund's *The Print Shop*, Springboard has announced the release of *Graphics Expander, Volume 1* ($39.95), which provides 300 new graphics for use with *The Print Shop*, plus drawing and editing tools. Now, no matter which company's product outsells the other, Springboard is happy. The program will be available for Commodore sometime this spring.

Not to neglect their own creation, Springboard has also released *Clip Art Collection, Volume 2* ($39.95) for *The Newsroom*, especially designed for business use with over 800 illustrations in such categories as medical, accounting, day care, travel, farming, and realty.

Springboard Software, 612-944-3915 (see address list, page 130).

PORTFOLIO MANAGER

The *Isgur Portfolio System*, when released sometime in 1986, will enable Amiga users to manage and track stocks, bonds, option commodities, mutual funds, and cash accounts, using a "Replay" macro function, built-in telecommunications program, graphic analysis, online help, and reviewing capabilities. But

if you have to sell off most of your portfolio to afford the $249.95 list price, stick with pencil and paper. A demonstration disk will be available for $7.50.

Batteries Included, 416-881-9941 (see address list, page 130).

MIDI I/O

Unlike their earlier MIDI Magic interface, which allowed owners of many MIDI-equiped electronic instruments to use their C-64's as playback devices, the new MIDI Magic I/O ($99.95) also enables the 64 or 128 to act as a digital recorder. The device plugs directly into the cartridge port. A six-song demo disk is included.

Q-R-S also announced that it will make its digital music library available in Amiga format during the first quarter of 1986. Each "album" of six songs, ranging from celebrity performances by keyboard greats like Joplin and Gershwin to contemporary artists, sells for $19.95.

Q-R-S Music Rolls, 201-838-5606 (see address list, page 130).

FREE FILM WITH DISKS

From March 1 through May 31, 10-packs of Fuji MD1D (single density) and MD2D (double density) 5¼" disks will be available packaged with a free pack of Fujicolor HR200 or HR400 12-exposure color print film.



For disk cameras? No—see above.
READER SERVICE NO. 144

Additionally, 10-packs of Fuji disks can now be had in an assortment of blue, green, red, gray, and beige jackets for color-coded filing.

Fuji Photo Film U.S.A., Inc., 212-736-3335 (see address list, page 130).

TELECOM NEWS

Cardco Inc. has chosen PlayNET as its exclusive online service, through which users will be able to order Cardco products and communicate with Cardco's customer service division. In most cases, Cardco customer service officers will respond within 24 hours. Cardco will also offer a free PlayNET membership kit with every product it sells.

Cardco, Inc. (see address list, page 130).

America People/Link announces that their subscribers can now upload or download electronic spreadsheet data and formulae.

American People/Link, 900-524-0100; in IL, 312-870-5200 (see address list, page 130).

FOUR FOR THE 64

Don't think the software shakeout hasn't hurt the little guys as well as the big. AC3L Software is now offering four of its previously announced programs: *IMCT* (Morse code trainer), *Notebook Fun* (study aid), *ESP Tester*, and *One-Shot* (word processor) on a single disk, for $29.95. That's for the rest of the world. For *Ahoy!'s* readers only the package is available for $4.95 plus postage and handling. You must state in your order that you are an *Ahoy!* reader to qualify for this special price. PA residents add 6% sales tax.

AC3L Software (see address list, page 130).

80-COLUMN ADAPTER

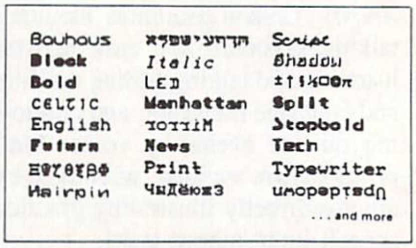
If the 80-column computing you do on your C-128 does not require color, the BI C-128 Monochrome Adaptor ($7.98) can save you the expense of a new monitor by providing a full 80-column display on any standard monochrome or color monitor. (If even $7.98 is too much for you, refer to Morton Kevelson's build-it-yourself instructions in the August '85 *Ahoy!*.)

Batteries Included, 416-881-9941 (see address list, page 130).

FONT MASTER UPDATE

Font Master II ($49.95), an upgrade of Xetec's multi-typestyle word processor, includes 30 fonts (15 more than the original), 65 text editing commands, 47 two-letter format controls, onscreen status/help display, foreign language capability (including right-to-left editing and diacritics), font editor/creator, and a backup disk.

Xetec, Inc., 913-827-0685 (see address list, page 130).



Some of Font Master II's *30 typefaces.*
READER SERVICE NO. 143

COMPUTER AIDED DESIGN

Intended as a tool for architects, artists, engineers, and students in the graphic arts, *CAD-3D* ($39.95) is a

"wire frame" design program based on the Cartesian coordinate (X, Y, Z axes) system. Designs can be rotated or shifted on all axes simultaneously. Modifications can also be made to any specified segments of a design; further enhancements can be made using other available graphics programs. Merging capability lets the designer superimpose saved designs or use them directly in original programs.

IHT Software, 415-441-1607 (see address list, page 130).

SEE IT & SPELL IT

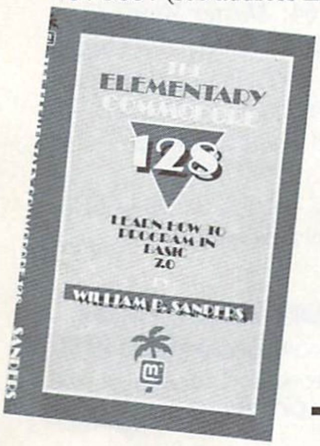
According to some experts, good spellers internally visualize words in order to spell them correctly. *Whole Brain Spelling*, available for years to IBM and Apple users and just translated to Commodore format, uses color graphics to develop these visualization skills. Six different word lists of 2000 words each are available.

SubLOGIC Corporation, 217-359-8482; orders 800-637-4983 except in IL, AK, HI (see address list, page 130).

BASIC 7.0 BASICS

The Elementary Commodore 128 ($14.95) by William Sanders, author of the bestselling *Elementary Commodore 64*, teaches the beginner to program in BASIC 7.0, from setting up the computer to creating graphic pie charts. Included is coverage of variables and arrays, loops, branches, input/output, sequential and relative files, sound and music, graphic animation, printers, sprites, and more.

Microcomscribe, 619-578-4588 or 484-3884 (see address list, page 130).



For the beginner who wants to learn BASIC 7.0 on the 128. READER SERVICE NO. 145

MULTIBOTS

The Multibots line of construction sets will allow C-64 and C-128 users to learn the principles of robotics by building computer-controlled robots, cars, cranes, and other projects. The heart of the system is the Interface Unit (#B100), which plugs into your 64 or 128 and connects to lights, motors, sensors, and other external devices. Add-on modules and kits in the series include:

The Speech Digitization Module (S100), featuring projects in digitization and playback, sounds, and sound effects. Included is software to turn the module into a digital voltmeter.

The Multiscope (M100), containing the hardware and software for experiments and projects using the computer as a digital storage oscilloscope and a digital voltmeter.

The Multibot Workshop (MB220), a complete scientific workshop comprising all the hardware and software of the S100 and M100 kits, plus interface unit, motors, components, software, and instructions for 50 projects.

The Multibot Workshop Plus (MB330), including everything in the MB220 kit plus additional construction components, sensors, a third electric motor, and software and instructions for 100 projects and experiments.

Other available modules include Thermodynamics (T100), Digital Electronics (DE100), Dynamics (D100), Instrumentation and Control (IC100), Robotics #1 (R101), Robotics #2 (R102), Motors and Generators (MG100), Infrared Remote Control (IRC100), and Switching and Relay (SR100).

Prices of the various kits and modules, which are being marketed by Access Software, range from $59.95 to $199.95.

Multibotics, Inc., 801-298-9079 (see address list, page 130).

REMOTE CONTROL ROBOT

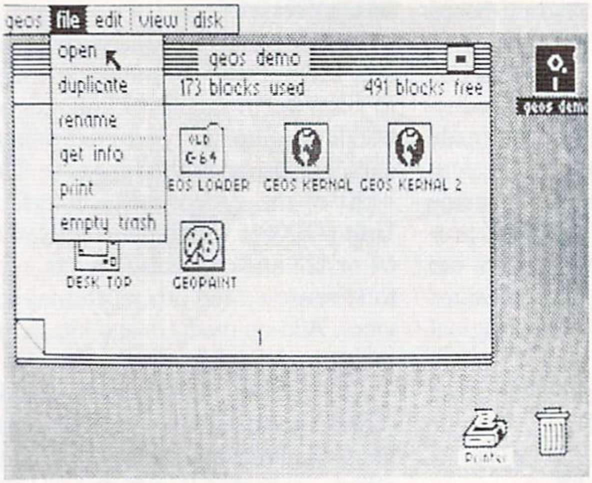
The 11.3" tall, C-64-programmed

R/C Robot from Maxtron remembers up to half an hour of movement commands and speaks the user's voice via a remote control handset that operates within a range of 100 feet. Included is C-64 interface and software that places instructions onscreen.

Maxtron, 818-350-5707 (see address list, page 130).

COMMACDORE 64

One of the two programs Commodore chose to display in their suite was the Quantum Link bulletin board system, reviewed in this issue (see page 63). The other was Berkeley Softworks' *GEOS* (Graphic Environment Operating System) *deskTOP* ($59.95), and we immediately understood why. The program makes the C-64 mimic a Macintosh more closely than we thought possible, supplying a user interface complete with menus, icons, and windows. The user can view, load, copy, and delete files by moving a pointer icon with a mouse or joystick. All part of an improved disk operating system that provides new file handling capabilities, including "turbo" routines that provide a 5 to 7 times improvement in disk transfer rates.



***Berkeley Softworks'* GEOS *software turns the C-64 into a multitasking computer utilizing Macintoshlike icons, windows, and pull-down menus. Special routines speed disk transfer rates by five to seven times.* READER SERVICE NO. 147**

Included are the *geoWrite* word processing and *geoPaint* graphics editing programs, both of which borrow further from the Macintosh: the former lets you compose documents in an exact image of how the printed page will appear, the latter allows images to be cut or copied from one application and pasted into another.

Berkeley Softworks, 415-644-0883 (see address list, page 130).

GRASP GRASPED

ShareData Inc. has licensed the rights to the "grasp" technology for the Commodore 64 and 128. Developed by VPL Research, the technology consists of a visual programming language operated by a glove input device. While wearing the glove, the user can "handle" and manipulate images on the computer screen. ShareData, which sells Commodore software through mass retailers at an average price of under $8.00 per program, will use the technology to develop animated programs for the market.

ShareData has also announced the Data-Share 300 modem ($29.95), offering 300 baud rate, auto dial/answer, 17K printer buffer, 10 macro keys, and terminal software.

Finally, the following Load 'N' Go/One Step programs are newly available for the 64: *Master Word, Electronic Scheduler, Tax Record Organizer, Family Tree, Vital Data Keeper, gBase, Trivia Quest, Peg Out, Alien, Bulge—A Battle for Antwerp,* and *Open.*

ShareData, Inc., 800-328-6061 or 612-829-0409 (see address list, page 130).

AUTOSTART CARTRIDGE

Not to be confused with the IBM-PC word processor of almost the

Continued on page 96

AUTO LOADER

A cartridge that plugs into your expansion port that makes loading and working with the disk drive much **easier.** With AUTO LOAD you will never have to type any of the load commands again. The cartridge will not interfere with **any** of your programs and has three different ways to load them.

1. Automatic mode allows you to set up a special file that has commands in it that you want the system to perform when power is first turned on. (Same as Apple's and IBM autostart files.)
2. If an auto-start file is not found then AUTO LOAD loads the directory and displays it in a menu format. Pressing one letter next to your selection loads and runs the program. Automatically!
3. Holding down different function keys while turning the computer on types in commands like (LOAD "*",8,1), (LOAD "*",8 + RUN), (LOAD"$",8 + LIST).

- **Use with a timer to have your BBS come up at a certain time. Automatically!**
- Load wedge first, change colors then load application without touching the keyboard!
- **Great** for programmers, can be used to load up several utilities in a row!
- Makes sorting thru and loading several different programs very **quick.** (as with public domain, multi utilities disk etc. . .)
- **Easy** for kids that cant type yet
- Comes with built in system reset switch

ONLY $19.95

D-CODER

- Translates any machine language program into easy-to-ready English descriptions with complete explanations of each command.
- Makes complete notations of all important memory locations accessed by the program (SID, VIC, MOS, KERNAL, etc.)
- Gives you three ways of accessing programs:
  1. **Will read and list programs from DISK**
  2. **Will read and list programs from MEMORY**
  3. **Direct user input (from magazines, etc.)**
- Can be used to locate and examine any machine language program's protection routines!
- Can be used to easily break apart machine language programs for study and examination!
- Printer option for complete hard copy listings!

You no longer need to be an EGGHEAD to read Machine Language.

$19.95

N-CODER

THE PERFECT COMPANION PROGRAM TO D-CODER!

Allows you to easily make changes,in machine language programs . . . right on the disk!

- Rewrite ability allows code to be altered and then rewritten directly to the disk!
- Features sector-by-sector scrolling assembly language display of machine language programs!
- Notation of ASCII text equivalents for easy spotting of embedded text strings!
- Handy reference display of all assembly language commands and their ML numerical equivalents!
- Byte splitter for easy splitting of decimal addresses into low byte-high byte format!

$19.95

Top Secret Stuff I and Top Secret Stuff II

Programed by Jim Drew

Are both collections of 20 programs per diskette (that works out to about $1.00 per program!) that help you explore and enhance your Commodore 64 and/or 128 and 1541 disk drive. Now you can unlock many secrets formerly known only to top machine language programmers by using these sophisticated "tools." If you have ever been curious about the inner workings of your computer system, now is your chance to dig in and find answers with the help of these programs. These collections of programs have gotten rave reviews from actual users, and we are sure that you, too, will be pleased.

These are just some of programs included.

TOP SECRET STUFF I

The Dock (view/repair disk contents)
Sync Checker (diskette)
Disk Manipulation System
Diskette Matcher (compare sectors)
½ Track Reader
Electronic Arts Backup
Drive Mon (disk drive m/l monitor)
Diskette File Log (start-end address)
Repair A Track (recover data)
½ Track Formatter

$19.95

TOP SECRET STUFF II

RAM Test (test Computer RAM)
Copy $AOOO-$FFFF (under ROMS)
Display G.C.R. (All sector data)
Smooth Scroll (messages up screen)
Koala Dump (koala pad screen dump)
Disk Protection System (stops copies)
Boot Maker (autobook BASIC programs)
Wedge - $COOO
Diskmatcher II (high speed version)
No Drive Rattle (on reading errors)

$19.95

TAX PAC

Tax preparation has never been a breeze except when you let your computer do it for you. This easy to use menu driven program follows your tax form line by line while computing all the necessary information. It has all the tax tables included for the forms listed below and will print out all the information you need to fill out your forms. Tax Pac reduces that chance of error in order to get that refund Quick!

- Tax Forms Supported: 1040, 1040A, 1040EZ, 2106, 2441, 4562, 3468, 941 and Schedules: A,B,C,D,E,G,SE,W
- Stores all your tax information on disk for easy recall or recomputation.
- Does all computations and prints all the figures you need to fill out your official forms.

Purchase price is tax deductible $24.95

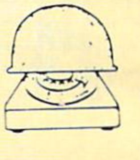
GRAPHICS AND GAME DISK

A stimulating x-rated adventure game, complete with graphics representations. This is not your typical adventure game. FEATURES ANIMATED X-RATED CARTOONS

*Joystick required

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WAR GAMES AUTODIALER



1. **Auto Dial** will automatically dial a set of numbers you choose.
2. **Review Numbers** will review numbers that were answered by a computer.
3. **Save Numbers** will save numbers where a computer answered.
4. **Hardcopy of Numbers** will print out list of numbers where a computer answered.
5. **LOAD Numbers** will load in numbers to continue where it left off.
6. **Continue** will pick up dialing where it was interrupted.

$29.95

SOFTWARE PROTECTION HANDBOOK

4th Edition!

SOFTWARE PROTECTION HANDBOOK
Fourth Edition! Now Available!

If you're **tired** of being harassed by **protected software** and too many **copy** programs, then this is the book for you! This 250 page manual covers the gamut from legalities to protection methods to step-by-step back up procedures. Now you can learn both how to **protect and unprotect** software! The techniques covered include copying cartridges to tape or disk, tape protection, and disk protection. Disk protection covers error numbers 20, 21, 22, 23, 27 and 19 **plus** single track formatting, header modification, header swapping, half track reading and writing reading and modified bit densities, formatting illegal track/sectors, sync writing and **more!** Forth addition contains the most unusual and innovative protection analysis tool for the Commodore yet! - **not for Beginners** - This system expands your 1541 drive giving capability otherwise only possible for **professional** disk duplication equipment. now you can create or analyze exotic forms of disk protection. **'D.O.S. Kings' Take Note!** - Entire tracks of data can be read and written without regard to 'standard' sync and format. You are no longer limited to sector by sector searches. Whole track readouts reveal hidden data even when all or most of the sectors have been erased. Uncovers and writes data under errors, pulse coaded sync or data, hidden data and access codes, multiple track densities and more! This manual covers the complete implementation of the track trap system including necessary software and hardware documentation.

C-64 Book Only .... $19.95 US

Book & Disk of all Programs .... $29.95 US

This manual does not condone piracy

THE XXXXXXXXXX

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• Powerful all machine language program. • Takes up only 4K of memory.
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Store programs or sequential in Ram for almost instant access. This gives you the advantage of having several programs in memory at the same time.
Imagine writing a game and having a sprite editor program in memory at the same time!

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MASTER LOCK

Here, at last, is a program that will protect your software programs from unauthorized duplicating. 1 to 1 million copies can be protected, fast and easy.

- Specially designed for the C-64 and 1541 Disk Drive.
- Completely encrypts and protects your programs.
- Fully compatible with almost all machine language and basic programs — can even support chained programs.
- Each system has been specially prepared and is unique from all other systems — only **you** are able to make working duplicates of your own protected programs.
- Fast and reliable protection routine does not take away any useable space from your disk — all 664 blocks are available for use.

Even the "nibblers" can't copy them. Not even *Disk Maker, *Mister Nibbles, *Copy II, *Ultra Byte or *Fast Hackem. The time to protect you disk is only 5 (five) seconds and each Master Lock makes a different protection scheme. Only

*Disk Maker™ Basix *Copy II™ Central Point Software
*Mister Nibbles™ Full Circle *Ultra Byte™ Ultra Byte
*Fast Hackem™ Basement Boys Software

$29.95

DIR+
A DISK LIBRARY CATALOGING PROGRAM

Having problems finding that lost disk? Here's a program that allows you to alphabetize and print out your program names in a versatile format. A scrolling arrow allows you to edit out meaningless names and keep what you want. Know what you got and where its at!

- 60 to 600 titles (1 to 5 COLUMNS) can be printed per page by using optional condensed printing.
- Print disk labels with your disk names and ID's.
- Can support up to 1100 program titles and can alphabetize in less than 15 seconds!
- Save the master list to disk for use with a word processor or a data base.

ONLY **$19.95**

TOOLBOX 64 AND NEW TOOLBOX 128

Side 1 contains over 100 routines, some of them are for protection, smooth scrolling, modem routines and sound and color. Also a bootmaker, paddle and joystick test; read terminal, and auto dial and auto answer. Documented routines allow you to use them to build your own programs or use alone. This disk has a lot of tricks that are used in commercial software.

Side 2 contains several of the same routines for the 128 system but also a T&S editor for going out to track 66, along with a screen dump for the 80 colum mode and lots, lots more.

Side 1 C-64 **Side 2 128** All for **$19.95**

64-128 CROSS REFERENCE BOOK

This is the first book available of its kind. Complete cross-references used to covert 64 programs over to the 128 computer. Book is formated on the left side with the location and label name, and then on the right with the equilvent 128 location. The entire range of memory is covered starting at 0-Page going thru BASIC and then thru the Operating System. A must for the serious 128 user.

$12.95

64 BBS

Full performance board with lots of extra's not found on others. Two different versions to satisfy your needs.

- Backroom password gives you access to 7 read and write rooms with 4 security levels
- Open chalk board, used to post messages by users
- Secret highest level
- Auto message cycling
- Remote access for sysop
- Printer option
- 300/1200 Baud
- 2 Levels of security for up and down load
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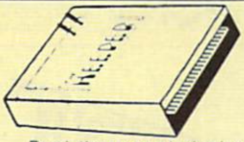
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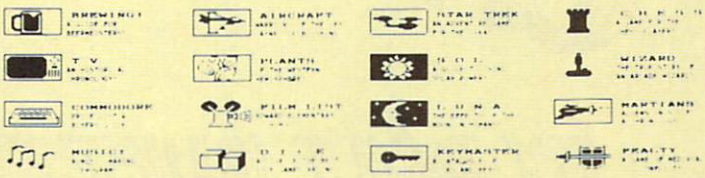
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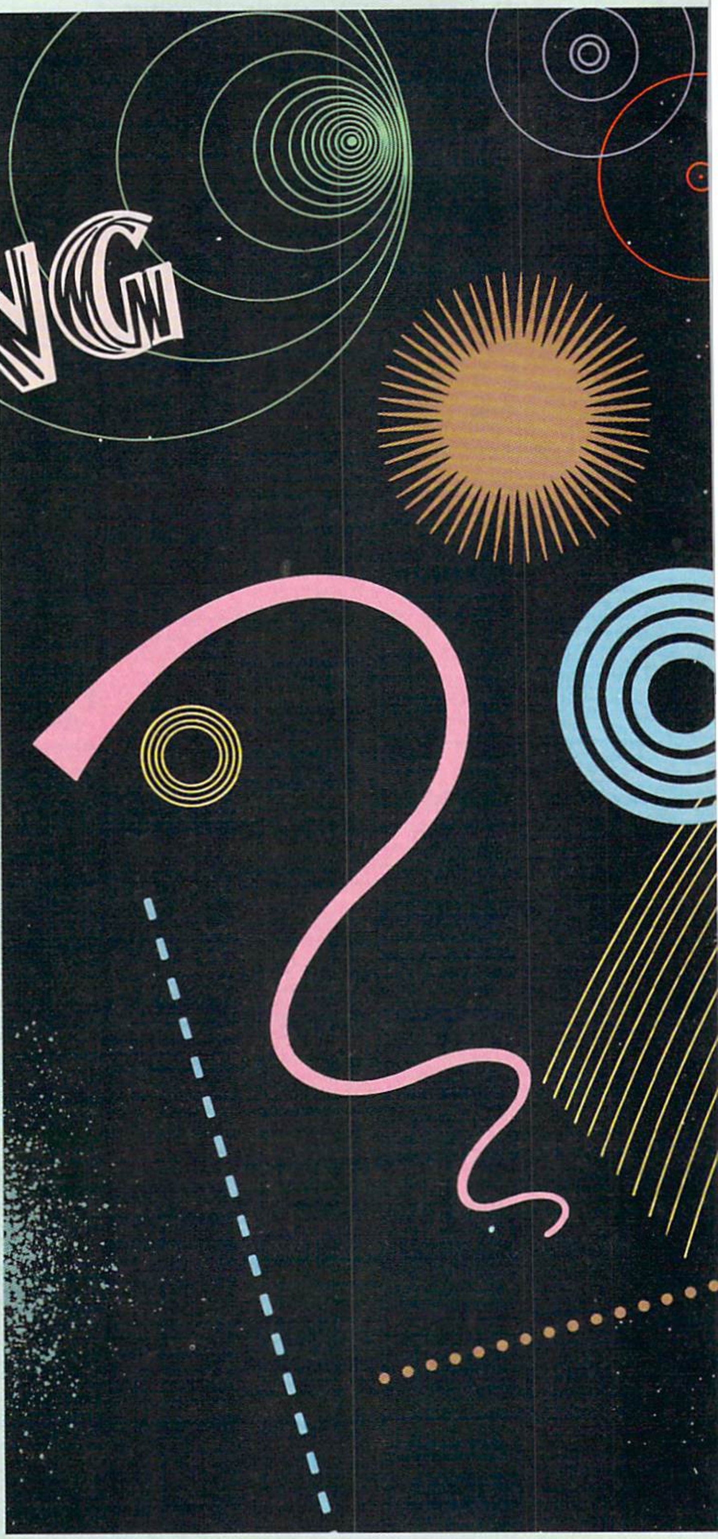
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COMET CATCHING



BY DALE RUPERT

An Interplanetary Simulation of Astronomical Proportions

Do you have what it takes to capture a comet? Here is your chance to find out. This month we will look at the physics and the software to simulate the motion of one object around another in space. The program is written for the Commodore 128, but we will discuss how the simulation can be modified to run on the C-64 as well as any computer with some type of bit-map graphics. We will also show off some of the niceties built into BASIC 7.0 of the C-128.

With the program presented on page 117, you are able to specify the initial position and velocity of an object in space which we will call a comet. The path of the object as affected by the sun's gravitational field will be plotted on the screen. From a given starting position, a comet may enter a stable orbit around the sun, or it may simply make one pass through the solar system, never to be seen again. You will find out that very small differences in the comet's initial parameters can make tremendous differences in the comet's behavior.

If you choose the comet's parameters properly, the comet will become a permanent addition to the solar system, perhaps traveling away from the sun for a hundred years or more before returning for another close encounter.

Choosing your own parameters to "catch" the comet can be a trial-and-error process. On the other hand, you may use published values and simulate the motion of actual objects such as the earth around the sun. Either way, you should find the program fun for experimenting. It comes with a guarantee that you will learn something in the process.

PHYSICS FUNDAMENTALS

Let's begin with the physics of the problem. We will assume that a relatively small object has some initial position and velocity in space. That small object moves under the influence of the gravitational force of some large



JAVIER ROMERO

object. Specifically, the small object could be a comet or a planet, and the large object is the sun.

If algebra and formulas do not interest you, skip ahead to the next section of this article. For the students of physics (past, present, or future), here is the mathematics involved. According to Newton's second law, a force (F) applied to an object of mass m gives the object an acceleration (a) according to the formula:

$$F = m * a$$

If the force is the result of the gravitational pull between two masses (m and M) which are a distance r apart, the magnitude of the force is

$$F = (G * M * m) / r^2$$

where G is the gravitational constant with a value of 6.673E−11 $m^3/kg{-}s^2$.

We will assume that one mass M (sun) is much larger than the other mass m (comet), and that the larger object remains fixed in space. Both assumptions are very accurate for comets and even for planets orbiting the sun.

Consider the comet at coordinate X,Y in a coordinate

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PROGRAM	STAR DOS	REGULAR LOAD	MACH 5	FAST LOAD	MAGNUM LOAD
Pitstop II (EPYX)	?	144 sec	43 sec	41 sec	31 sec
Music Shop (BRODERBUND)	?	105 sec	105 sec*	105 sec*	21 sec
Hitchhiker's Guide to the Galaxy (INFOCOM)	?	70 sec	70 sec*	**	68 sec*
On-field Football (GAMESTAR)	?	159 sec	66 sec	63 sec	56 sec
EASY FINANCE I (COMMODORE)	?	58 sec	13 sec	13 sec	11 sec

* = Will not fast load — defaulted back to regular load.
** = *Failed to load at all.*

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C64, C128, 1541, 1571 and Datasette TM Commodore; MSD TM Micro Systems Development; MACH 5 TM ACCESS; FAST LOAD TM EPYX, STAR DOS TM Star Point

system with the sun at coordinate 0,0. The acceleration of the comet in the horizontal direction (when viewed from above the plane of its orbit) is given by AX:

$$AX = [(G * M) / r^2] * (X / r)$$

where

$$r = SQR(X^2 + Y^2)$$

Similarly the acceleration in the vertical direction AY is

$$AY = [(G * M) / r^2] * (Y / r)$$

If the initial speed of the comet is V, then after an amount of time T, its speed will be (V + A*T) where A is the acceleration. Similarly, if the comet is initially at position X, its position after an amount of time T will be (X + V*T). Once the new position is known, the new values of r, AX, and AY can be calculated, followed by the new velocities, and then the next position. If the increments of time are small enough, this sequence of calculations gives reasonably accurate results.

In order to improve the accuracy of the calculations, we will use the "half-increment" method to iteratively determine each position of the comet. To find the position of the comet after a time interval DT, for example, we first calculate the comet's velocity at time DT/2. Using that velocity, we calculate its acceleration and then its position at time DT.

The velocity is calculated halfway into the next time interval (at time 3/2 * DT), and that velocity is used to determine the comet's position and acceleration at time 2*DT.

The formulas to calculate the acceleration, velocity, and position of the comet are shown in lines 270 through 300 in *Comet Catcher* on page 117. The first time through the loop, DD has a value of 2 so that the velocities are calculated at time DT/2. Line 410 sets DD to 1 so that succeeding velocities are calculated at 3*DT/2, 5*DT/2, and so forth.

If you want to learn more of the physics of this problem, look into a text on classical mechanics under the topic of the two-body problem. You will also find many details in the *McGraw-Hill Encyclopedia of Science and Technology* under the topic "Celestial Mechanics." One other excellent source of information is the book by Robert Eisberg, *Applied Mathematical Physics with Programmable Calculators* (McGraw-Hill, 1976).

CONCEPTS INTO SOFTWARE

With the formulas and the method of solution understood, have a look at *Comet Catcher.* Of the six possible screen modes for the C-128, this program uses mode 2, called the standard split-screen mode. The GRAPHIC 2,1,22 command in line 10 selects mode 2, clears the screen (1), and defines the screen lines 22 through 24 to be devoted to text. The upper part of the screen is for bit map graphics.

There are advantages and disadvantages to using split-screen mode, as opposed to full-screen bit map graphics. The primary advantage of using the split screen is that text may be placed onto the screen by means of the PRINT statement. In particular, the PRINT USING statement gives text formatting capabilities which are very useful, as we shall see.

The disadvantages of the split-screen mode are that the text to be PRINTed must fit into a specified window, and we must be careful about how the text is written into that window. Another problem with the split-screen mode is that when the program is stopped and control is returned to the text mode, the split-screen text window disappears, and the whole screen is now bit-mapped. That was a problem during debugging. I use an RGB monitor for the 80-column text mode and a separate "green screen" composite monitor for the graphics display. Whenever I stopped the program to modify it, the parameters displayed at the bottom of the screen vanished. The solution is to rewrite the parameters at the bottom of the screen using the bit map text command CHAR. Refer to lines 520 through 560.

If the program had used the bit map mode (instead of the split-screen mode), CHAR would be used to locate and print text onto the screen. CHAR gives the flexibility of being able to specify the screen column and row at which the text is to be located. The string to be printed is the last argument in the CHAR statement. As line 520 shows, any combination of string types is allowed.

The PRINT USING statement provides a very easy way to format the text being displayed on the text screen. Refer to lines 380 through 400. The first parameter of PRINT USING is the format string. It may be a literal, as shown here, or it may be a string variable. The format string is followed by the parameter (or parameters) which are to be displayed according to the format string.

Certain characters within the format string have special meanings. Other characters are displayed literally. For example, consider the statement

```
380 PRINT USING "V= ####.## KM/S";VT
```

The "#" is a place-holder for one numerical digit. Consequently, when the value of VT is printed, it will use four screen locations in front of the decimal point, and its fractional part will be rounded to two decimal places. If VT has the value 235.4567, line 380 will generate

```
V=  235.46 KM/S
```

The format string also controls how string items are to be displayed. The "=" must be separated by a space from the "#", since "=" is also a format control character. We will discuss the other options of the PRINT USING statement in a future article.

Here is one further note on CHAR and PRINT statements. The CHAR statement may be used in text mode (40 or 80 column) to position the cursor before the PRINT statement is executed. A statement such as CHAR ,5,20," " puts the cursor at column 5 of line 20 on the screen, so that any printing begins there. Unfortunately the CHAR statement does not work for locating text to be PRINTed in the split-screen mode. That is the reason for the TAB statement in line 400.

The program displays three lines of text at the bottom of the screen. Figuring out how to position the text required some experimentation and head-scratching. My solution is to create a text window in the split-screen text area, and to disable scrolling of text. As long as three lines of text are always printed, the display is updated properly.

The WINDOW statement in line 50 defines the window. The difference between this statement and the text window specified in the GRAPHIC statement discussed earlier is that WINDOW *confines* the cursor to that region. With the split-screen specified by the GRAPHIC statement, the cursor may be anywhere on the screen. If the cursor is above the split-screen text window, it is not visible. Likewise, any text printed outside of the split-screen window is not seen. Consequently the separate WINDOW statement is needed so that all text remains in the visible region.

Scrolling is disabled by using one of Escape codes. (The Escape codes, by the way, are among the most fantastic features of the C-128! Take the time to explore them if you haven't already. We will discuss them in depth in a future article.) It is as easy to use the Escape codes within a program as it is in direct mode. ESCAPE is represented by CHR$(27). Line 40 sends the escape sequence "ESC M" which means "disable scrolling."

Escape sequences are not displayed on the screen. Instead they send control commands to the processor. Run this program without line 40 to see why the scroll-disable is necessary. If you would like a debugging challenge, swap lines 40 and 50, and try to explain the results. The moral is this: Using text in the split-screen mode requires some careful planning. This program shows one way to do it.

CREATING A COMET

If the colors are not to your liking, simply change the parameters in lines 20 and 30. The constants used by the program are in lines 70 through 110. The other parameters listed in lines 130 through 200 define the comet. Those are for you to choose at will.

Distances are specified in Astronomical Units (AU). One AU is the average distance from the earth to the sun. It amounts to 1.496E11 meters as shown in line 80. Velocities are given in meters per second (M/S). You may choose the basic time increment TM (in days) in line 130. The time increment determines how often the comet's position is recalculated. The smaller the time increment is, the more accurate the resulting display will be, and the longer the program will need to plot the complete orbit.

The height of the screen (part of which will be hidden behind the text window) is given by HY (in AU) in line 140. Choosing a smaller number is equivalent to magnifying the display.

The actual parameters of the comet are given in lines 160 through 200. To completely define the comet's motion, you must specify its starting position and its velocity components at that position. The sun is at location 0,0. A standard, four-quadrant Cartesian coordinate system is used.

X is the horizontal coordinate (+ to the right, − to the left). Y is the vertical coordinate (+ is up, − is down). A comet that is initially 4 AU from the sun, and located at the "nine o'clock" position with respect to the sun, would be at X=0, Y=−2. If this is not clear, try various values and see where the resulting orbit begins on the screen. Choose a proper value of HY to see the orbit clearly.

The comet has two components of velocity, one in the X direction (VX) and one in the Y direction (VY). Its actual velocity is the combination of these two components. If the comet begins at the "nine o'clock" position and at that instant is moving vertically downward at 5000 meters per second, VX equals 0 (since its motion is only vertical) and VY equals −5000 (since down is in the negative Y direction).

Once the comet moves to its new position, it will have different values for X, Y, VX, and VY. The sun's gravity pulls the comet radially towards the sun. Consequently the comet gains some velocity in the X direction. It moves horizontally because of the sun's pull, and at the same time it moves vertically because of its initial velocity. Its new position is the result of those two independent motions.

The main loop of the program calculates and plots the new position of the comet at each interval specified by TM. PX and PY in line 310 are the scaled X and Y values to be plotted. Line 320 checks to see that they are on the screen. If so, line 330 puts a dot on the screen at that location.

Some of the current parameters are displayed at the bottom of the screen by lines 360 through 400. VE is the escape velocity for an object at the comet's position. V is the combination of the comet's two velocity components. By comparing V with VE you may determine whether the comet is actually "caught" by the sun. In a case where V is greater than VE, the comet will not be back for another visit. In a case where V is less than VE, the comet is still held within the gravitational "potential well" of the sun.
ted with each point plotted. Also the total number of days (T) since the program began is shown in the lower right corner. The rate at which T is incremented is determined by TM in line 130.

Line 420 looks to see if any key has been pressed since the last time through the loop. If no key has been, the loop is repeated.

ADDED TOUCHES

Pressing certain keys while the program is running gives you "real-time" control over the output. Pressing the (RETURN) key at any time stops the program and returns to the text mode screen. As the program is written, it returns to the 80-column text mode and displays that message on the graphics screen. If you prefer returning to the 40-column text mode, change the GRAPHIC statement in line 560 to GRAPHIC 0.

Pressing the "P" key or the "No Scroll" key causes the program to PAUSE until another key is pressed. This lets you study the displayed parameters.

The "S" and "F" keys put the computer into the SLOW and FAST modes, respectively. In the FAST mode, the graphics screen disappears. It remains vanished until you press the "S" key. If the plot is very dense and slow, you may prefer to let the computer work "double time" in the FAST mode for a while. Simply press "S" to bring back the graphics screen and check on the progress.

The <CRSR UP> and <CRSR DOWN> keys increase and decrease the time increment between successive calculations. You will find that the resulting orbit may change drastically with differing time increments even if the other initial parameters are the same. Each press of one of these keys changes the time increment by plus or minus ten percent. Recall that the initial time increment is given by TM in line 130.

The keyboard routines use two new features of the C-128, INSTR (pronounced "in-string") and GETKEY. INSTR is handy for this type of keystroke decoding. The first argument of INSTR is a string containing the allowable keystrokes. In this program, the second argument A$ is the current keystroke value.

INSTR returns a number corresponding to the position of the first occurrence of the second string within the first string. For example, if the <RETURN> key is pressed, A$ has the value CHR$(13). The INSTR function then has a value of 1 since CHR$(13) is the first character within the first INSTR argument. Consequently the ON-GOSUB statement branches to line 520 which is the first line number in its list, and the program ends.

If the "F" key is pressed, INSTR returns a value of 4, since "F" occurs in the fourth position within the first INSTR argument string. The ON-GOSUB statement calls the subroutine at line 480, since 480 is the fourth line number in the list.

If any other keys are pressed, A$ is not found within the first INSTR argument string. INSTR has a value of 0, and the program then continues with the next statement, namely 450 GOTO 270, for the next iteration of the main loop. (Note that the definition of ON-GOSUB in the C-128 System Guide is not quite correct. The program resumes with the next *statement*, not the next *line*, if the value of the expression is 0.)

The GETKEY statement is equivalent to the C-64 sequence

```
460 GET A$ : IF A$="" THEN 460
```

In other words, GETKEY waits until one key has been pressed, and that value is given to A$. GETKEY can accumulate more than one keystroke, but each one must be assigned to a separate variable, such as GETKEY A$,B$,C$.

FOR COMMODORE 64 USERS...

To run *Comet Catcher* on the C-64 or any other computer, you must provide a routine to plot points on the 320 by 200 bit map screen. The *Rupert Reports* in the June and July 1985 issues of *Ahoy!* provide BASIC and assembly language routines for bit map graphics.

Many more programs will be written and published for bit map graphics now that the C-128 makes them so easy to use. Consequently I have modified the main routines from those previous articles so that C-64 users may incorporate them into *Comet Catcher,* as well as into other C-128 programs written for GRAPHIC modes 1 or 2.

Have a look at the C-64 *Bit Mapper* program on page 118. It is comprised of three main subroutines. The first, beginning at line 1000, sets the bit map graphics mode and clears the bit map memory. The "clear memory" function is implemented in the machine language routine generated at line 4000. You may choose the foreground and background colors in line 1110. Other details will be found in the original articles.

The second subroutine starts at line 2000. It is called to turn on the pixel at location PX,PY. PX ranges from 0 to 319 and PY ranges from 0 to 199. The point 0,0 is in the upper left corner of the screen. The third subroutine begins at line 3000. It resets the bit map mode and returns to text mode. Any other computers you might use must be able to provide similar subroutines or capabilities.

To use *Comet Catcher* on the C-64, you must make the following changes. Substitute lines 10 through 60 and 440 through 485 of *Bit Mapper* into *Comet Catcher.* Change line 330 of *Comet Catcher* to be

```
330 GOSUB 2000
```

Delete the following lines from *Comet Catcher*: 360,380, 390,400, and 510 through 560. Add lines 1000 through 4110 of *Bit Mapper* to *Comet Catcher.*

None of the text parameters will be displayed on the C-64, which is quite a disadvantage. The <CRSR UP> and <CRSR DN> increase and decrease the time increment between points. "P" will pause the display, and <RETURN> stops the program and restores the computer to text mode.

FURTHER POSSIBILITIES

There are numerous possibilities with this program. For example, you might substitute actual parameters for the earth's or other planets' motion. The earth's velocity is 29.8E3 meters per second when it is the average distance from the sun (1 AU). Try these values in lines 130 through 200:

TM=1 : HY=3 : X0=−1 : Y0=0 : VX=0 : VY=−29.8E3

Keep an eye on the time to see just how many days it takes the earth to complete one orbit.

During your experimentation, you will no doubt observe the phenomenon known as the "gravitational slingshot." You will see this when the comet comes very close to the sun at a slow speed and is flung out into space at a very high speed.

If you want to adventure into the bizarre, you can very easily create "antigravity." Simply remove the minus sign from the definition of K in line 110. When K is positive, the force between the two bodies is repulsive rather than attractive. You may simulate subatomic attractions and repulsions just by changing the value and sign of K. It could be fun and easy to be able to switch gravity on or off. Modify the INSTR function in line 440 to decode some other keystroke which will replace K with zero, then press that key to see what happens if the sun's gravity suddenly vanishes.

With some work, you could modify this program to handle more than two objects. At each step you would calculate and add the forces from all massive bodies on each other. How about showing the moon orbiting the earth as it orbits the sun? For starters, walk over to that computer and catch a comet. □

SEE PROGRAM LISTINGS ON PAGE 117

JCALC

A Spreadsheet for the C-64

By Jeff Balvanz

Almost everyone acquainted with microcomputers has at least seen an electronic spreadsheet. *JCALC* is a program to perform the essential functions of such programs as *VISICALC*, *Supercalc*, and *Lotus 1-2-3*. Since most of the routines are written in BASIC it's fairly slow, but it does a creditable job of laying out a worksheet, defining relationships between cells, and allowing the entry of numbers, labels, and formulas at different spots on the worksheet. *JCALC* can store 450 numbers and many formulas with labels in a C-64 or a VIC with only 8K of expansion RAM. Formulas are not described by names, but by their position on the worksheet, just like *VISICALC*. Finally, *JCALC* can print all or part of the worksheet to any logical device except the RS-232 port.

ABOUT THE PROGRAM

Most of *JCALC* is devoted to the screen editor, which allows you to move an active cell around a worksheet and edit the contents of the individual cells. The heart, however, is the calculation subroutine (890-999), which goes through the active part of the worksheet, identifies the formulas, translates formulas stored in terms of cell addresses to formulas describing relationships between elements of an array, and then POKEs that formula into the BASIC input buffer. A machine language subroutine is then called which tricks BASIC into thinking that it is intrepeting a statement that has been typed in from the keyboard in direct mode. This subroutine is stored in the REM statement in line 0. The *ML Subroutine Builder* on page 114 creates this line from a short string of DATA statements. The advantage to this approach for short ML programs is simple; the subroutine is automatically protected from BASIC since it is a legitimate BASIC line. There are no restrictions on editing the BASIC program containing it (as long as that line remains the first line in the program), and you don't have to reserve space for the subroutine by POKEing to the "start of BASIC" pointers before loading the program. You can use this truck in your own programs, but watch these two restrictions: the program must be relocatable anywhere in memory, and it must not contain any zero bytes.

ENTERING JCALC

Typing JCALC is in a two-step process. First enter the *ML Subroutine Builder* program on page 114 (VIC owners should make the changes listed on the next page) and run it, which creates the machine language subroutine Then delete any line above zero and list the program. You will find that all of the lines above zero have disappeared. This is because we POKEd a zero byte just before the zero byte marking the end of line zero, which creates an end of program marker.

Now enter the *BASIC Portion*, also on page 114. VIC 20 users should make the changes shown below; there are surprisingly few changes required, and I was tempted to make this a "conditional" program that would automatically adjust to whatever machine it was running on. Memory economy prevailed, however. Don't forget to save the final product.

USING JCALC

To start, load *JCALC* and type RUN. The screen will clear and you will see the upper left hand corner of the worksheet. Column letters will appear at the top and row numbers at the side. In the upper left hand corner of this worksheet area will be a box one row high and nine columns wide in reverse video. This is the active cell; anything you type in will be entered into whatever cell the active cell occupies at the time. The active cell can be moved in three ways: with the arrow keys, which move one cell in any direction, with the HOME key, which returns the active cell to cell a1, and with the GOTO key (press >). When you press the ">" key *JCALC* will ask you for a cell address to GOTO. Enter the address and press <RETURN>.

Valid entries for cells fall into three types: numbers, labels, and formulas. To enter a number in a cell, just type in the number and press <RETURN>. Numbers are always displayed with two decimal places and are right-justified in the cells. Labels must begin with an apostrophe (also known as a single quote) which you will find as the shift of the 7 key. Labels may be up to 9 characters long and will be displayed left-justified. Formulas must begin with an = sign and may be approximately 40 characters long. There is no limit built into *JCALC*, but if a formula is more than about 40 characters

or VIC 20 (+8K)

long it will cause a "Formula too complex in 926" error when *JCALC* tries to evaluate it. The contents of cells are referred to by their addresses (i.e., al for the cell in the first row of the first column, etc.). The column letter must be lower case. Formulas may contain any BASIC function. You may also add special function definitions of your own to JCALC just before line 1100 if necessary. In addition, there are five special range-oriented functions which operate on groups or ranges of cells on the worksheet. These are as follows:

@sum(range)—adds all the numerical entries in a range
@avg(range)—averages all the numerical values in a range
@max(range)—returns maximum value in a range
@min(range)—returns minimum value in a range

You must enter the formula name in lower case letters.

Ranges are described by separating the addresses of the upper left hand cell and the lower right hand cell in the range with a colon. For example, the cells in column C from row 3 to row 10 would be written as "c3:c10".

You can also use logical expressions in a formula. *VISICALC*, for example, has an @IF formula that returns one value if an expression is true and another if it is false. We can simulate that function in *JCALC* using logical expressions. Let's say we want a cell to be equal to 5 if cell c7 is equal to 1, but −3 if c7 is equal to 2. The formula you enter in *JCALC* would look like this:

=-(c7=1)*5-(c7=2)*3

Remember that for Commodores, a true logical expression is equal to -1 and a false expression is equal to zero. You can, of course, use the NOT, AND, and OR operators to create more complicated formulas.

JCALC uses the eight function keys to perform special functions. To use these functions, press the proper key and follow the directions.

f1—CALC

Each formula is calculated by *JCALC* when you enter it based on the values currently on the worksheet. If you go back and change some of those values you will have to recalculate all the formulas (which *JCALC* does not do automatically because recalculation is a fairly slow process—that is written in BASIC, after all). Just press f1; *JCALC* will clear the screen and display a "WAIT" sign, then redraw the worksheet when it's finished.

f3—EDIT

To change the value, formula, or label in the active cell, simply press f3. The contents of the active cell will appear on the top two lines of the screen along with BASIC's normal editing cursor. Edit the entry as you would a BASIC line and press <RETURN> to finish. Notice that labels and formulas are surrounded by double quote marks; this is because they are, in fact, strongs and the quote marks are used to keep the string together even if it contains a comma or other delimiter. *Don't delete the quote marks or the apostrophe!*

FOR VIC 20 USERS—

JCALC will work on a VIC 20 with 8K of expansion RAM if the following modifications are made.

Replace lines 30 and 60 of the *ML Subroutine Builder* with the following:

```
30 IFCK<>4734THENPRINT"ERROR IN DATA STA
TEMENTS -- CHECK YOUR PROGRAM":END
60 DATA 197,165,10,133,122,169,2,133,123
,32,165,201,173,112,3,133,122,173,113,3
```

Replace line 5, 1000, 10004, and 10005 of the *BASIC Portion* with the following:

```
5 POKE36878,15:FORTT=1TO50:NEXT:POKE3687
8,0:RETURN
1000 W=22:NC=1:NR=17:MC=15:MR=30:SO=4096
:LC=0:TR=0:CW=9:LL=213:POKE36876,200:POK
E10,0
1004 BL$=LEFT$(BL$,CW):GOSUB84:Q$=CHR$(3
4)
1005 REM THIS LINE NOT USED IN VIC-20 <-
 DELETE
```

Bug Repellent Line Codes listed after the program lines on pages 114-116 are for the C-64 only.

f5–BLANK

To remove the entries from a range of cells, press f5. *JCALC* will ask what range of cells you want to erase; enter a valid range and pres <RETURN>. If you don't enter a range *JCALC* will assume that you want to erase the active cell. The contents of the range will be erased and the screen redrawn to reflect the changes.

f7–REPLICATE

This key can be used to copy one cell into a range of cells. Press f7 and *JCALC* will ask you which cell you want to copy. Enter the cell address and press <RETURN>. (It doesn't have to be the active cell.) *JCALC* will next ask you for a range to copy the cell to; enter that range and press <RETURN>. The contents of the "from" cell will be copies verbatim to the "to" cells. WARNING: if you copy a formula you will have to edit it to reflect its new location.

f2–SAVE

A spreadsheet isn't worth much if you have to redo all your work every time you want to use it; you need to be able to save your work for later. Press f2 to save the worksheet. *JCALC* will first ask which device number you want to save to. You can "save" to any valid Commodore device number except 2 (the RS-232 port). Use 1 for tape or 8 for disk, or to see the structure of the data file you can "save" to the screen (3) or printer (4).

If you have chosen tape or disk, *JCALC* will next ask for a filename; enter a filename and press <RETURN>. Tape owners will immediately be asked to press record and play, so have that data tape ready before you press <RETURN>.

f4–LOAD

This, of course, is the reverse of the SAVE procedure and looks much the same; enter device number and filename. Once again, tape users should have the data tape ready to go before pressing <RETURN>.

f6–PRINT

The print routine is normally used to send output to a printer, but may be used to create sequential files on disk or tape. Press f6 to print; *JCALC* will begin by asking for a range to print. Enter a worksheet range and press <RETURN>. *JCALC* will then ask for the device number and filename; enter the appropriate information and press <RETURN>. The files created by the PRINT routine are sequential PET ASCII files, and may be used by many word processors or sent over the phone lines by communications programs.

f8–QUIT

This is the route out of *JCALC*. Press f8 and *JCALC* will ask if you really want to quit. If you type "y" or "Y" you will be returned to BASIC. Anything else will return you to the worksheet.

IF PROBLEMS OCCUR

You will very rarely get an error message and an abrupt return to BASIC. This is occassionally caused by a bad formula; check the last entry you made just before the crash with the EDIT function. You can always get back into *JCALC* by typing "GOTO 1100 <RETURN>". The worksheet on the screen will be messed up, but you can fix that by pressing <HOME>.

If you find that you need a bigger worksheet, save your work to tape or disk, exit *JCALC*, and go into line 1000 and increase MR (the maximum number of rows) and/or MC (the maximum number of columns). Save the new version of *JCALC* and you can reload your original worksheet and continue working. This only works, of course, if you have more memory to work with. I like to monitor my memory usage by putting a formula containing the FRE function somewhere on the worksheet. This can be deleted when the job is finished, of course. A VIC 20 with 8K expansion will have about 2300 bytes free for label and formula storage with the standard 15x30 worksheet; all of the storage space for numeric values is already defined.

Feel free to add features to *JCALC*. You might add a better copy function, sorting routines, or even *Lotus 1-2-3*-like graphics or data management routines. On a Commodore 64 or 128 there should be plenty of room left for innovation. □

SEE PROGRAM LISTING ON PAGE 114



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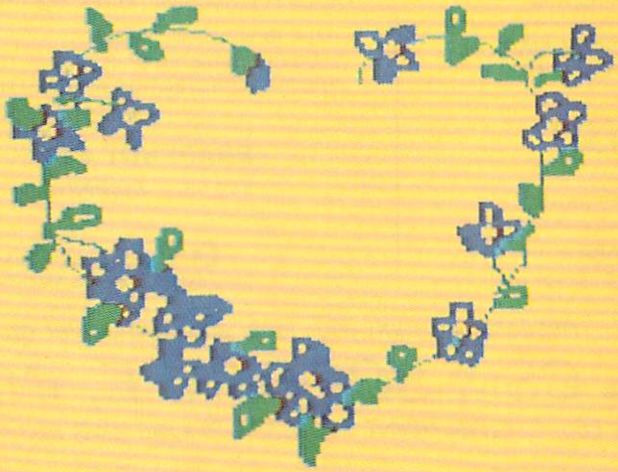
Reader Service No. 105

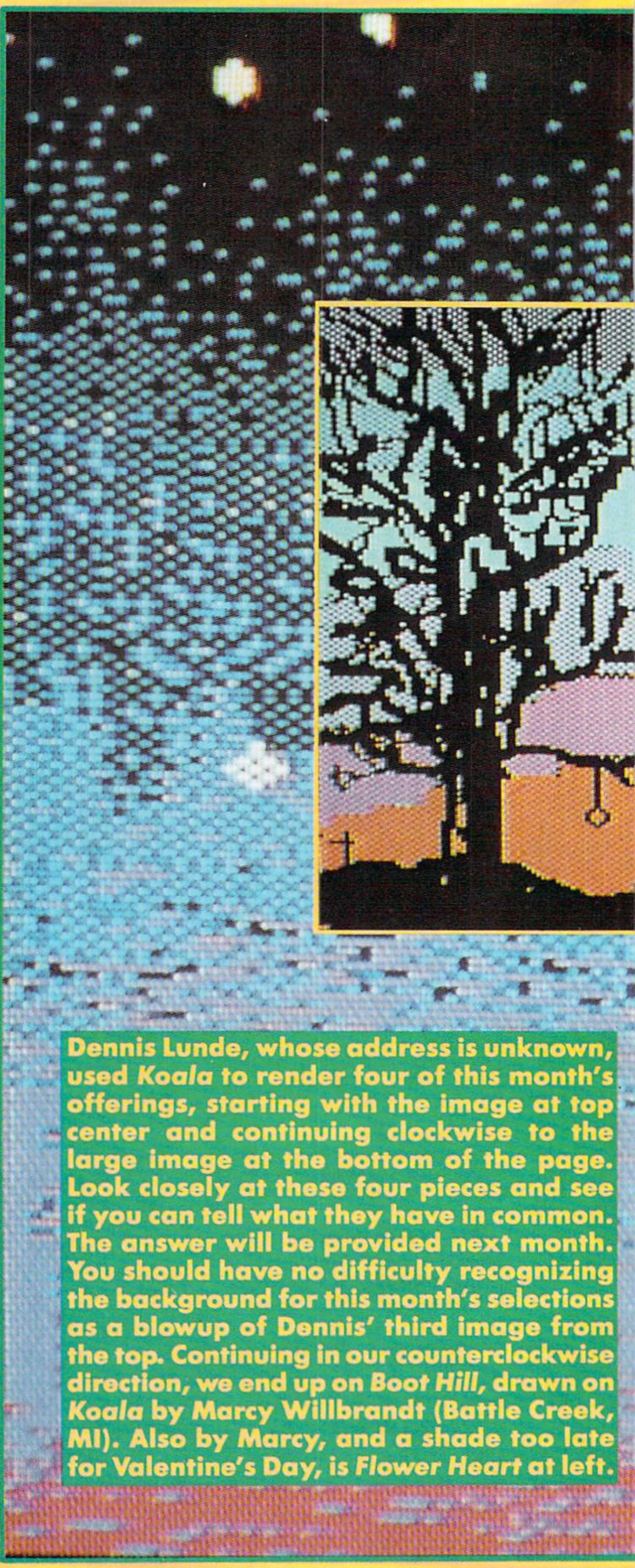
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Contributors to *Ahoy!'s Art Gallery* will receive royalties based on the sale of disks. Send your best work on disk, accompanied by a stamped and self-addressed mailer, to Morton Kevelson, P.O. Box 260, Homestead Station, Brooklyn, NY 11229. Indicate the drawing package that was used to create the image. If you employed a bit map of your own design, indicate the appropriate file parameters, i.e., hi-res or multicolor, location of bit map, screen or color data.

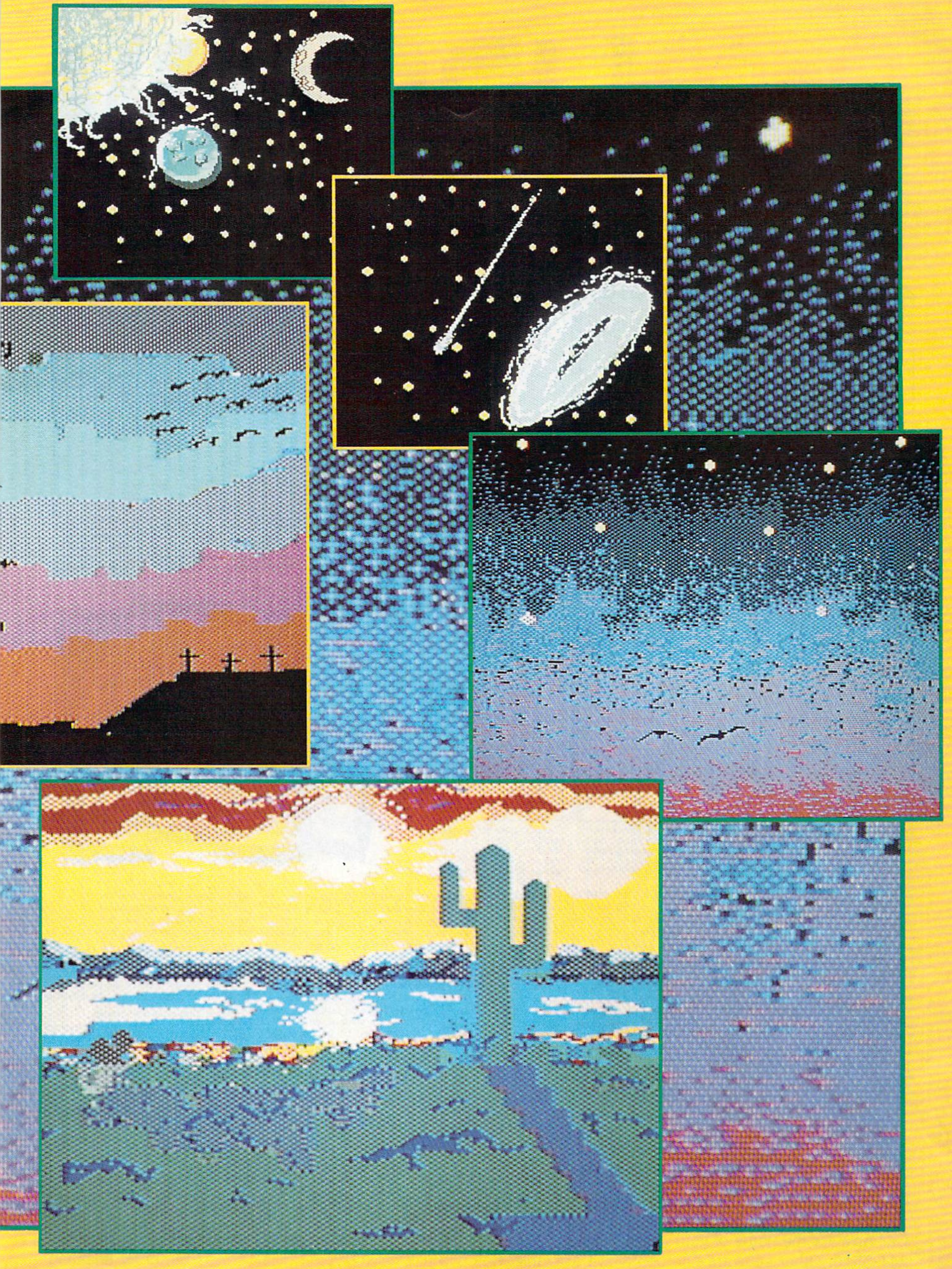
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Art Gallery images are available on disk. High resolution bit-mapped images are available in *DOODLE!* format. Multicolor bit-mapped images are available in *Koala* format. Each disk includes a slide show program for easy viewing. *DOODLE!* disks include a bit map screen dump utility for the 1525 or properly interfaced dot matrix printer. *Koala* disks include a set of custom routines for bidirectional conversion to other multicolor formats. The conversion routines were expressly developed for the *Art Gallery* by Michael Beutjer of K.T. Software, author of the *Koala Printer* program and *Quad Print* (June '85 *Ahoy!*). Formats presently supported are *Cadpic, Peripheral Vision, Paint Magic,* and *Flying Colors.* Disks are available for $15 from Morton Kevelson, P.O. Box 260, Homecrest Station, Brooklyn, NY 11229. Send a stamped and self-addressed envelope for a complete listing.

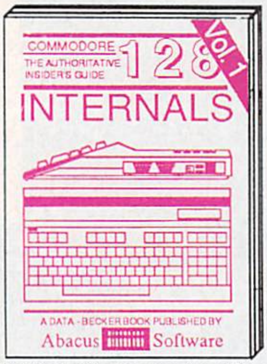




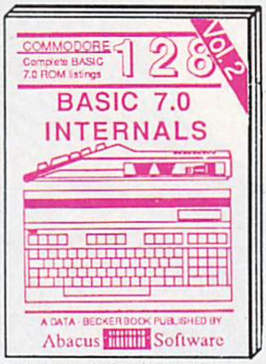
Dennis Lunde, whose address is unknown, used *Koala* to render four of this month's offerings, starting with the image at top center and continuing clockwise to the large image at the bottom of the page. Look closely at these four pieces and see if you can tell what they have in common. The answer will be provided next month. You should have no difficulty recognizing the background for this month's selections as a blowup of Dennis' third image from the top. Continuing in our counterclockwise direction, we end up on *Boot Hill*, drawn on *Koala* by Marcy Willbrandt (Battle Creek, MI). Also by Marcy, and a shade too late for Valentine's Day, is *Flower Heart* at left.



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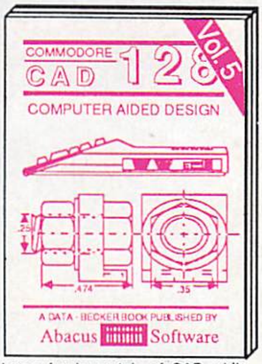
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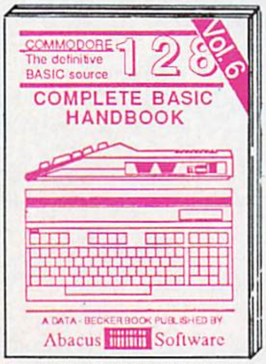
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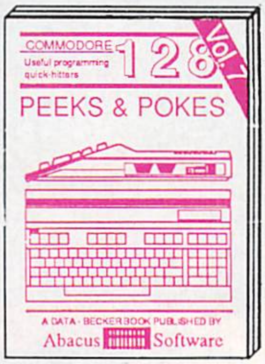
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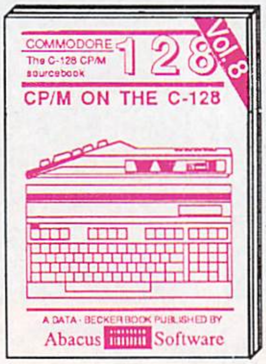
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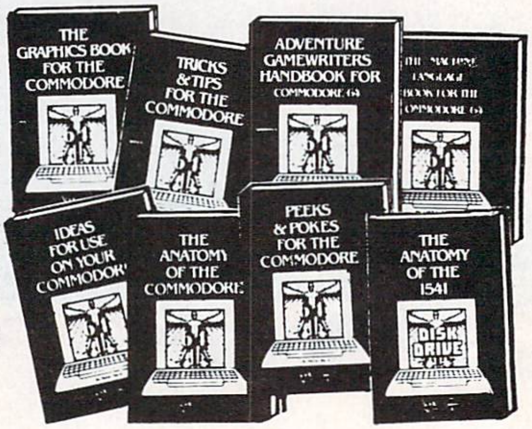
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AIR RESCUE

For the C-64

By Cleveland M. Blakemore

Count Von Mordo's ruthless air squadron has left the proud metropolis of Kernalville in flames. The inhabitants have fled to the rooftops to escape the inferno. The only ship left intact by the surprise assault is the U.S.S. Commodore, a hydrogen-filled dirigible. As you pilot the blimp over the city, your job is to pick up the refugees standing on the sentinel tower ladders, waving frantically for you to hover nearby so they can board you. Beneath them an inferno rages, and since you are piloting a hydrogen-filled blimp, you will have to use discretion before you pick up one of the survivors.

You can either fire one of your cruise missle CO_2 cannisters at the base of the fire to extinguish it, or if you are very careful you can drop just close enough to pick up a passenger, but not close enough to be threatened by the flames. it is a great deal safer to fire one of the missiles, which by the way, are excellent for knocking down enemy biplanes in a clinch.

The biplanes are of two types. one is the bright red assault plane, one of Von Mordo's highly trained kamikaze pilots who will try to crash into your blimp as they pass. The other is the relatively harmless escort plane, which may be any color. The escort plane flies just over the city skyline, so it can be a nuisance when you are trying to pick up a new passenger.

The assault plane squadron also carries machine gun ammunition, which they use sparingly—but stay alert, they can fire on you when you least expect it!

As if you didn't have enough problems, there is a fuel bar on the bottom of the screen which shows your current fuel reserve. Just drifting uses no fuel, but whenever you move you burn some up, so keep non-essential aerial acrobatics to a minimum. When you are out of fuel, you will drift helplessly until a plane crashes into you. Luckily for you, however, a large yellow gas balloon with a huge "G" on the side jounces merrily by once in a while to replenish your reserve. Whenever you touch the balloon you will fuel up to the maximum, so make sure you touch it every time it passes by—you cannot afford to let it drift off the screen without getting some fuel.

When you have picked up five passengers, you will drop them all off and a new mission begins. The color of the city changes and the game gets increasingly more difficult. If you manage to make it to mission seven, you get an extra ship bonus.

The joystick controls are self-explanatory. With a joystick plugged in Port 2, push up to go up, down to go down, left to slow up, and right to move forward. Push the fire button to launch a CO_2 missile. You can control the descent rate of the missile by pulling down on the joystick as it moves, which is a big help in hitting the target. Each ship has 20 missiles to start with, and you get another 20 each time you complete a mission. Fuel is only replenished when you make contact with the fuel balloon.

Scoring is as follows:

Baron's red biplane	50 Points
Escort plane	25 Points
Extinguishing fire	75 Points
Picking up refugee	200 Points
Completing mission	500 Points

Play wisely and you might make it to the terrifying blackout level at mission 16! My high score to date is 12,975. . .But I know there are *Ahoy!* readers who will pass that with their eyes closed.

If you flip this game over past 65,535, please write me care of *Ahoy!* I would be absolutely flabbergasted! □

SEE PROGRAM LISTING ON PAGE 121

MR. MYSTO

Artificial Semi-Intelligence for the C-64 and C-128

By Frank DiNunzio

Mr. Mysto sees all, knows all, and tells all. Just think of a word and he will tell you what it is. If, for some odd reason, you are able to stump him, he learns from the experience and will never be embarrassed by that word again.

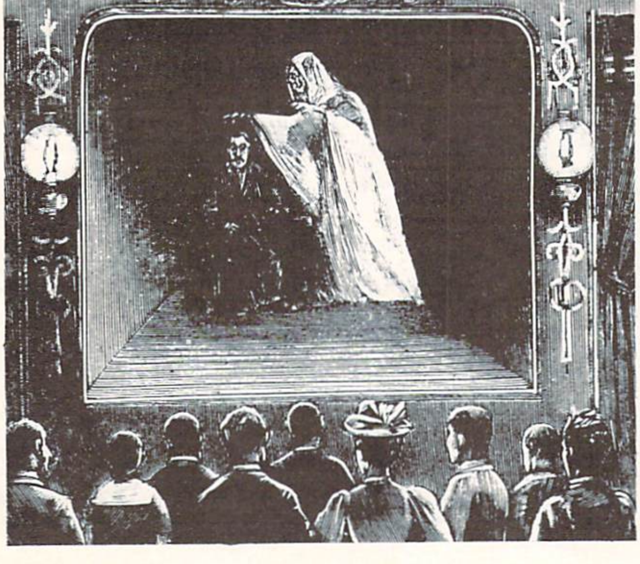
Mr. Mysto is an experiment in artificial semi-intelligence, or semi-artificial intelligence, or whatever. In any case, he gets smarter as he runs. The program runs on the C-64, or on the C-128 in 128 mode.

Although it is written as a game, you will see that the program has many other practical applications. I will go into these later in the article.

When the program is first run, Mr. Mysto is pretty stupid. In fact, he doesn't know any answers at all, but he will ask for a clue question and try to deduce the answer. But as you interact with Mr. Mysto further, he will become almost as smart as the questioner. In fact, the more people that use the program, the broader his knowledge becomes.

The program begins by asking you to choose either to START a new category or GET an existing one from disk. If there is no category on disk, you must start a new one.

The next part of the program draws Mr. Mysto's face on the screen and asks if you want him to talk. If you choose 'Y', he will mumble some unintelligible phrase after each answer. The user then thinks of a word and Mr. Mysto will try to guess it by using clues he extracts from the user's answers to his questions. If there is data from previous running, he will probably guess the word correctly the first time. If it is the initial time the program is being used, there will not be enough data to form a correct answer. But always remember that Mr. Mysto's motto is "You may fool me once but you won't fool me twice on the same word."



Here is how the program works. First you are asked to think of a word. Let's use Mickey Mouse for our example. Mr. Mysto will first ask, "Is it Nothing?". (This is the default question that is asked if the program has never been run before.) So you type 'N' for no and Mr. Mysto will say, "I am sorry but I do not know the answer, please tell what it is." At this point the user types "Mickey Mouse". Now the program will want to know "How can I tell Mickey Mouse from Nothing?" You can type an appropriate question such as "Is it an animal?". Mr. Mysto will then ask "What is the answer for Mickey Mouse?", to which you should reply "Y" for yes, because Mickey is an animal.

Mr. Mysto now knows one answer and after recycling he comes back with the question "Is it Animal?". If your reply is "Y", he will say "Is your word Mickey Mouse?" Another "Y" will get you an "I am right again." message from Mr. Mysto and he will ask if you "Want to try again." Ending at this point will cause the data to be saved on disk and the program will terminate.

For sake of illustration let's suppose that the second time through the program you were thinking of "Eve" as the answer. Now when the program asks "Is it animal?", you still reply "Y", but when it asks "Is your word Mickey Mouse?", then type "N". It will then say "I am sorry but I do not know the answer, please tell what it is." At this juncture you would enter "Eve" and the program will ask "How can I tell Eve from Mickey Mouse?", to which the user replies "Is it human?", or some other question that will show the difference between the two items. The final inquiry in this round would be "What is the answer for Eve?". Of course you would type "Y" because Eve is human.

From this point on, the program continues to cycle, each time giving the user more choices and making more decisions itself. I will go through the third cycle just to show how the options increase as the program continues.

Mr. Mysto: Is it animal?
User: Y
Mr. M.: Is it human?
User: Y
Mr. M.: Is your word Eve?
User: Y
Mr. M.: I am right again, want to try another?


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User: Y

Mr. M.: Pick a word and I will try to deduce what it is.

Each time a NO is encountered on a guess, the program asks for a clue to the word and adds those clues and words to its memory until it is able to search through all the "Y" and "N" combinations to match with the proper answer. Mr. Mysto may seem a little dumb at first, but he becomes very smart when his database becomes large. Then he will appear to be a Miracle Mentalist indeed.

The program is good for teaching logical skills to children and can be used to classify animals, vegetation, minerals, etc. Although it is set up as a game, I have a version, without the face and sound, that I use to diagnose automotive and electronic troubles. Once you use this program and get the feel of its logic, it is easy to set up a troubleshooting procedure.

Here is a brief description of how the program works. A two dimensional array containing YN$ and Q$ is created using data gathered by the questions asked. The YN$ is a group of Y's and N's that represent YES and NO answers, strung together in the proper order. A search is conducted to match the YN$ and TA$. If one is found the corresponding question (Q$) is printed on the screen. When there are no more matches in the YN$ array, the answer is shown as Mr. Mysto's guess.

Although entering data into the program is not critical, I have a few suggestions that will make it operate more efficiently.

The first thing that I suggest is to use a separate disk for data files because they can be long. Next, try to keep the word that you think of as specific as possible. That is, don't use Duck when you mean Donald Duck. Even more important is to reply to the questions with broad answers first and then narrow down the category. For example, if you were thinking of Adam, you should use clues such as Animal, Mammal, Human, Male, etc., in that order. This will allow the program to zero in on the answer much faster and save you from having to enter the same clues repeatedly. Finally, you may change an answer if it is not specific enough. Suppose the user is thinking of the Hope Diamond but Mr. Mysto only guesses "Diamond." Just type "N" for the answer, because you want him to guess a paticular diamond. Now enter "Hope Diamond" and then when prompted type "Is it a special Diamond?" The program will adjust your amended answer to fit into the proper place, and the next time you run *Mr. Mysto* he will ask if it is a special Diamond before he makes his guess. Remember, if the guess is not 100% correct, you can still change it by entering "N" and then clarifying it with another question.

There is another feature that I have put into the program to help with spelling or grammatical errors. If you have made a mistake with your typing and entered the wrong data, you can still make corrections at any time by pressing the f1 button when asked "Want to try again?". This will put you in the editing mode. The answers will scroll by one at a time and all you have to do it type "N" to go to the NEXT question or "C" to CHANGE that particular one. All corrected files will be sent directly to disk automatically.

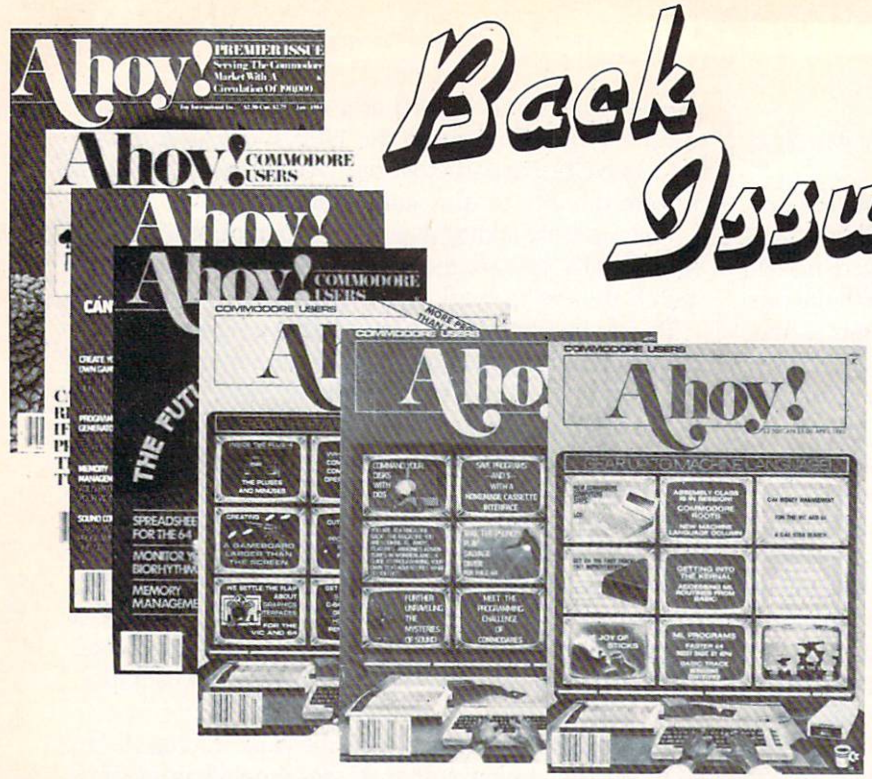
When you are adding data to the program, it will pause occasionally to sort the information in order for the search routine to work more quickly.

To get you started, there is a second program that will build a data file containing names of States. Type and run it to create the STATES file on disk. Now it can be used in conjunction with the main program to demonstrate how *Mr. Mysto* operates. It does not have all the states in it because I wanted the user to be able to add to the file and see how it modifies itself.

Since *Mr. Mysto* is self-prompting, even small children who can read will be able to use it. I would suggest that an adult first run the program until a good database is formed, then let the youngster take over. Just remember, Mr. Mysto is no smarter than the person who uses him. If you make errors he will echo them.

The program is modeled after the game 20 Questions, so if you are familiar with that, you should have no problems using *Mr. Mysto*.

One last thing. The program runs much faster if the user chooses the no talking option. If you decide on the talk mode be sure to turn up the volume on your monitor. ☐ ***SEE PROGRAM LISTING ON PAGE 119***



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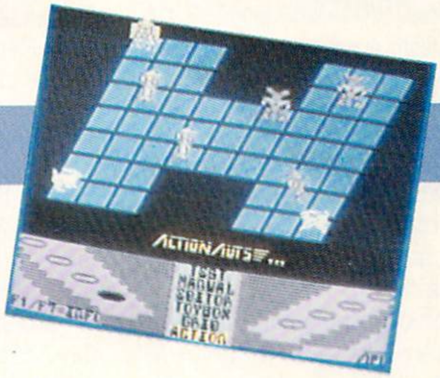
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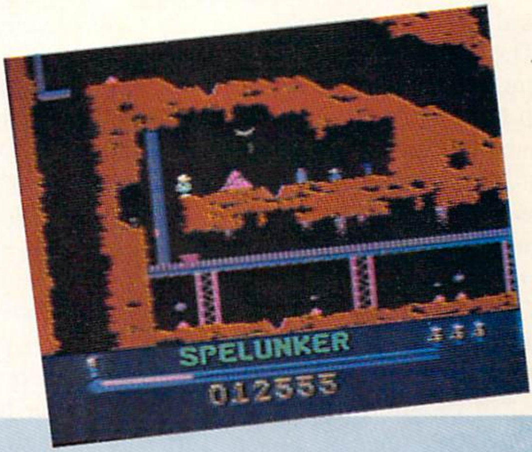
THINK FAST!

Action-Strategy Games for the Commodore 64

By Bill Kunkel and Arnie Katz







Above: **Koronis Rift**, *a Lucasfilm/Epyx offering (READER SERVICE NO. 290). Top right:* **Actionauts**, *reviewed on page 46; and available on this month's* **Ahoy!** *program disk. Bottom right: down the shaft with* **Spelunker** *from Broderbund (READER SERVICE NO. 291)*

Joystick games aren't dead, but the form has certainly mutated in the Computer Age. Contests which stress hand-eye coordination dominated the 1978-1983 period, but many of today's joystick-oriented entertainments challenge brain as well as brawn. Action strategy software is rewriting the Greek adage, "A healthy mind in a healthy body," to read "A lucid mind connected to a lively joystick."

The action-strategy genre isn't unique to computer software, but it has reached its fullest flowering in the electronic context. As the name suggests, the action-strategy game is a mixture of elements drawn from both action and strategy contests.

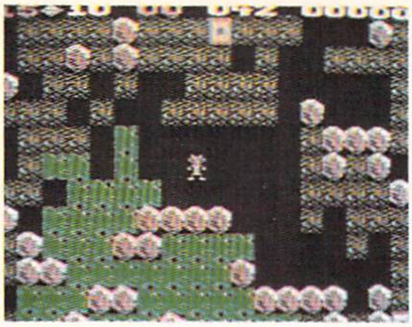
In traditional strategy games like chess, the player uses intellect to analyze situations and develop winning strategies. But orthodox strategy contests, whether classics like *Go* and *Checkers* or relative newcomers such as *Clue!* and *Squad Leader,* seldom generate a feeling of urgency. Most strategy games allow a player to think as long as need requires and the patience of the other participants permits.

Events move at a far less leisurely pace in the action-strategy universe. Players must think "on the fly," and he who hesitates is hopelessly lost.

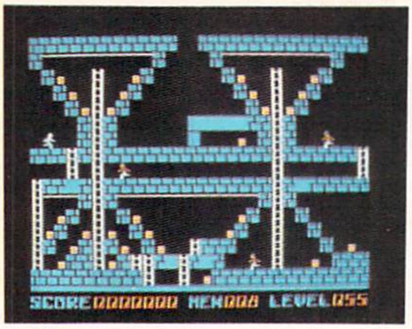
Lode Runner (Broderbund) epitomizes the "real-time puzzle" type of action-strategy game. The player employs a joystick to direct the onscreen activities of a super-agent known as the Lode Runner on a dangerous mission inside the headquarters of the Bungeling Empire. Each of the program's 100 playfields contains devilishly placed caches of gold and several tenacious guards. In each instance, the Lode Runner must collect all the gold while avoiding the deadly touch of the minions of the evil empire. Only after Lode Runner has acquired all the gold does the route to the next playfield appear.

Unlike most maze-chase games, there are no "power pills" which enable the "runner" to turn on the guardians, but the gallant spy isn't quite defenseless. A push of the action button allows Lode Runner to either dig for gold or excavate pit-traps to catch and delay the guards.

The first few screens, though a stern test for neophytes, serve primar-



Boulder Dash: *tunnel for buried gems.*
READER SERVICE NO. 292



Lode Runner: *many screens, sequels.*
READER SERVICE NO. 293

ily to sensitize the user's mind to the type of thinking required to solve the higher-level playfields. Later rounds put an increasingly great premium on capturing all the ore and reduce the guards to a nuisance role. The guards are still pivotal, however, since it's tough enough to solve brainbuster without a crew of death-dealing guardians on your heels.

The graphics on *Lode Runner* are spare, but attractive. Ladders and hand-over-hand bars connect brickwork horizontal platforms. The Lode Runner and his tireless pursuers are simply drawn, but evocatively animated. The visuals put the spotlight squarely on gameplay, where it belongs.

One of the disk's best-liked features is a construction set which allows the computerist to build an unlimited number of new playfields.

Championship Lode Runner (Broderbund) uses playfields developed by *Lode Runner* designer Doug Smith, other members of the Broderbund family, and creative fans to separate the action-strategy wimps from the wizards.

Championship Lode Runner presents "only" 50 screens, but each is guaranteed to take twice as long to solve as even the original's most difficult ones. The very first screen, entitled "Hello and Welcome," is as tough as anything in *Lode Runner,* and the difficulty rises steeply from that point.

The sequel uses essentially the same graphics as *Lode Runner,* but there's more emphasis on extra touches, such as the secret messages worked into many of the playscreens. As the box proclaims, it's only for experienced *Lode Runner* players, and even many self-styled experts will want to pick up a copy of the hint book Broderbund developed to ease gamers through the bottlenecks.

Lode Runner's Rescue (Synapse) boldly breaks the mold of the earlier titles. It is generally similar to the first two programs, but its appearance and play-action are distinctly different.

The intrepid hero of *Lode Runner* and *Championship Lode Runner* has evidently taken one risk too many, because he has become a prisoner of the Bungeling Empire. It's up to his daughter Alexandra to collect all the keys and elude the pesky guards while she searches playfield after playfield for her imprisoned dad.

Alexandra can't dig pits like her famous father, but her jumping talent makes her equally hard to catch. She can run on level ground, hop up one level, or leap down two steps without danger. Longer falls, however, are fatal unless she lands on an elevator, in the water, or on the exit. Like Alice in Wonderland, Alexandra grows taller if she eats one of the special energizing snacks. While in this form, she can leap higher and fall farther than normally.

The fresh graphics treatment views the familiar brick-and-ladders landscape in three-dimensional perspective, which results in a much better-looking game. It also introduces the extra complication of "blind spots," areas which are hidden from the computerist's view by larger objects in the foreground. The onscreen surrogate is larger and more detailed than in the previous two games, which heightens player identification.

Jack Attack (Commodore) is, like *Lode Runner,* a dynamic puzzle, but it stresses action and trap-setting rather than conventional puzzle-solving. The user guides "Jack," a rotund bouncer, around an environment composed of horizontal platforms and huge square blocks.

Jack's job is to repel the invasion of fatso attackers who drop one at a time from a horizontal column at the top of the screen. Jack can effectively squash one of these bounding round mounds by pouncing on it, though it's more fun to use the joystick to move around the large blocks and set up hammer-and-anvil traps which catch unwary attackers between a block and a hard place.

As time elapses, the platforms disappear. This does not necessarily doom the hero, since he can fall any distance without harm. A tumble into water is fatal, and so is getting smashed flat by a falling block.

Boulder Dash (First Star), a 1984 hit which has become an entertainment classic, is a fascinating "collect-the-objects" contest. As Rockford the terrific tunneler, the player scours playfields for precious gems while avoiding avalanches.

The boulder formations create puzzles of varying difficulty. Each time Rockford shifts a boulder to clear his path, the rocks cascade down the screen until they resettle. Each shift sets up the next challenge. Higher-level puzzles add more elements, including deadly butterflies which Rockford can eliminate only by beaning them with rocks.

The audio and graphics are excellent, with lots of delightful touches. For example, Rockford becomes impatient if the gamer ponders the next move too long. He shows his displeasure by crossing his arms and tapping his little foot.

Spelunker (Broderbund) is also an excursion into the underground, but the setting is considerably less fanciful. The player uses the joystick to lead the onscreen cave-crawler down a mineshaft to explore a vast network of caves filled with flares, explosives, caches of oxygen, keys, and other invaluable pieces of equipment. The spelunker must leap over chasms, ride in tiny ore cars, and even battle vaporous ghosts with the help of a

small fan which disperses the phantasms in this stimulating macro-maze.

The graphics are amazingly intricate. Visual highlights of the journey through the cave complex include stalagtites and underground volcanoes. The viewpoint character is embellished with similar details, like the little light on his explorer's helmet.

Rescue on Fractalus (Epyx) exemplifies another type of action-strategy program. This Lucasfilm-designed title puts the gamer into the cockpit of a sub-orbital fighter which must skim low over the surface of an enemy-infested planet to retrieve downed fellow pilots.

Merely flying the "Valkyrie" spacecraft without crashing into the mountains is challenging, but it's only half the story. Pilots must also master the twin tasks of staying alive against the anti-aircraft barrage of the hostile Jaggi forces and picking up those stranded comrades.

The graphics are one of this game's greatest virtues. The landscape, mapped out through the use of "fractals," is full of mountain ranges, broad valleys, and lofty peaks which make all-too-perfect locations for Jaggi bunkers. This graphics system gives physical features a definite spatial relationship to one another. You can fly through a valley, circle a peak, and zoom through the same chasm from the opposite direction

Fans of this game should check out the latest offering from Lucasfilm, *Koronis Rift* (Epyx). In this one, the player pilots a "techno-scavenger Scoutcraft" which is engaged in looting a dead civilization of its technological treasures.

While exploring an ordinary-seeming planet, the player stumbles upon the storied Koronis Rift, a proving ground for the weapons and wonders of an ancient, star-spanning race. The player must execute a series of complex maneuvers involving robot surface rovers and other onboard technology to scoop up the goodies while evading the mindless guardian saucers, programmed eons earlier to defend the grounds at all costs.

Spy Vs. Spy (First Star) is a favorite of those who enjoy strategy-oriented head-to-head competition. This whimsical contest, inspired by the long-running Prohias comic strip from the pages of Mad Magazine, provides a separate visual display and order-entry system for each player, so that everything takes place simultaneously and in real time. To the right of each display window is a "trapulator," a toolbox for secret agents. It monitors the progress of the game and gives the spies access to a series of cartoonish traps.

The spies race against time and each other to find the secret documents hidden somewhere in the embassy. Shrewdly deployed traps can slow down the competition. The first spy to collect the secret plans, key, tickets, and traveling money can catch the waiting airplane for home.

The graphics are splendid, as is the simple but effective theme song which runs throughout the game. Designer Mike Riedel also has a suitably light touch with the traps. When a snare stings a spy, the result can be hilarious. The gamer whose spy is in trouble must watch an agonizingly slow-motion catastrophe overtake his minion. For instance, an agent who gets zapped by the electrocution trap turns into an animated x-ray plate. And when one of the antagonists goes to the big debriefing room in the sky, the ghostly image of a spy with angel's wings rises toward the heavens.

Spy Vs. Spy II: The Island Caper expands and improves on the concepts which Riedel's first effort introduced. All the traps are new, and this time the masters of mess-pionage cavort around a small chain of islands as they try to unearth the parts of a super-secret missile.

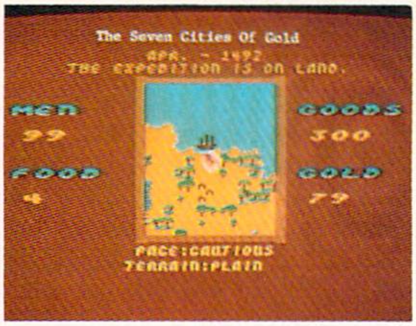
If anything, the visuals are even better the second time around. Not only does each player have a separate display screen, but each view scrolls in response to onscreen movement. The interplay of trap and counter remains the program's primary drawing card. Finding the missile parts is a lot easier than hanging onto them against a determined foe.

Ghostbusters (Activision), from design legend David Crane, incorporates a surprising number of elements from the hit comedy. It's easy to master the simple strategies and skills needed to become a successful spookchaser, but the program's real attraction is the excitement of being a character in the world of the hit movie.

A construct kit allows new ectoplasm exterminators to select a vehicle and accoutrements to launch their business. The gamer can spend the bank account built up from play-session to play-session to buy more sophisticated devices.

Then it's time to hit the full-screen map of Manhattan and have a got at the legion of etherial entitles roaming wild over the city. The object is to freeze the "roamers," exorcise ghosts already established in buildings, stop the cataclysm taking shape at the Temple of Zuul, and knock out the big fluffy fiend, the Marshmallow Man, whenever he materializes.

The audio overshadows even the excellent visuals. The insistent beat of the *Ghostbusters* theme defies the player not to hum along. The program also employs speech synthesis at several points, including a pathetic "he slimed me" when a spirit turns the tables on the hunters.



Seven Cities of Gold: ***see the world.***
READER SERVICE NO. 294

Sometimes the action and strategy don't occur simultaneously. Some programs segregate these elements into separate phases. The effect is like a chess game in which the players periodically rise from the board to pummel each other about the head and shoulders.

Archon (Electronic Arts) by Freefall Associates was the first title to exploit this concept. Each player commands a small army of icons, each of which represents a mythological creature, in a battle between the forces of light and darkness. The two sides have abstract confrontations on the ever-changing gameboard, and they engage in more action-oriented battles when strategic conflict leads to real-time combat.

Each *Archon* "piece" has specific strengths and weaknesses, including a characteristic method of movement. Unlike chess, the *Archon* board has squares which cycle endlessly through a light-dark-light sequence. When a square is bright, the forces of light gain power from it, but the army of the night draws equal strength when a square goes black.

The most significant difference between *Archon* and chess occurs when rival pieces dispute the same square. The program shifts to its combat mode, in which the contesting icons are banished to an arenalike screen for a real fight. It is here that the icons' unique personalities and powers take on explicit meaning. The unicorn is fleet and fires a bolt of light from his horn, but he is also fragile, unlike the lumbering Golem or the massive but thick-witted Troll.

Archon was a revolutionary game, and a very popular one as swell. *Archon II: The Adept* (Electronic Arts) restructures the conflict along different lines and makes the strategic gameboard less similar to chess.

In *The Adept,* each icon symbolizes a force allied with one of the elements—earth, air, fire, or water. Spellcasting and a constantly mutating gameboard remain the key factors.

As in the original, the graphics are excellent. The icons really seem to come to life during combat sequences.

Unfortunately, *The Adept* doesn't match the originality or play-value of *Archon.* The laudable attempt to further differentiate the game from conventional chess simply misfires. Though worth a long look from those who especially like *Archon, The Adept* just isn't as much fun.

Mail Order Monsters (Electronic Arts), on the other hand, is pure lighthearted mayhem. Likely to appeal most strongly to younger gamers, it concerns building and managing bizarre fighters in a series of professional combats in a variety of settings.

A combat mode based on the *Archon* system is the major play-element. The gamer uses a construction kit to create a gladiator who battles other super-fighters for gold and glory in the arena. The strategies are fairly straightforward, but the action phase is exciting enough to partially atone for the lack of mental challenge.

Seven Cities of Gold (Electronic Arts) displays a similar dichotomy between action and strategy. The Ozark Softscape design team takes the solitaire game back to the great age of exploration. The computerist must secure a patron, outfit an expedition, and set sail from Spain to the uncharted lands of the New World.

The Atlantic crossing is fraught with the same uncertainties that bedeviled 15th-century explorers, including crude navigational equipment, long supply lines, and the perils of an unexplored wilderness.

An expedition can assault the hemisphere like a band of Conquistadors or opt for a more enlightened approach. Either can prove successful if skillfully implemented.

When a landing party reaches a native village, a closeup of the habitation and its citizens fills the screen. The gamer steers the symbol representing the party around the village while the beat of native drums communicates the mood of the local populace.

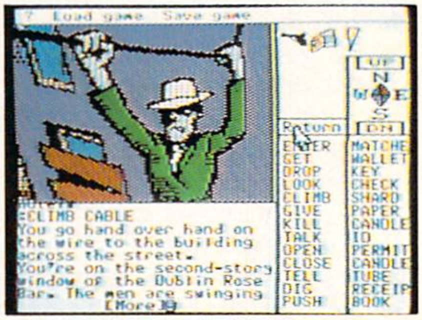
The party bumps into a native to execute an attack. Combat may break the spirit of the tribe or cause it to go berserk and slaughter the explorers. Careful joysticking can bring the party face to face with the chief, who will often accept a little bribe to get lucrative trading underway.

Heart of Africa (Electronic Arts) is the recently published sequel to *Seven Cities of Gold.* This time, a letter from a New York law firm designates the player as the heir apparent to the late Hiram Perkins Primm. Before the casket magnate's fortune becomes yours, however, you must complete the task which cost your benefactor his life, the search for the

BORROWED TIME

Activision
Commodore 64
Disk; $29.95

Ever have a feeling that someone's out to get you? That strange eyes are watching you from a darkened doorway? That the armies of the night are on the march against you? These lurid imaginings become all too chillingly real in *Borrowed Time,* a mystery adventure with more plot turns and twists than a backwoods mountain road.



Borrowed Time: ***a mean plot punch.***
READER SERVICE NO. 295

It all begins with a phone call. The anonymous tip is that someone's out to kill you, a Raymond Chandler-esque gumshoe. Unfortunately, the good samaritan neglects to tell you who or why. Could it have something

Lost Tomb of Pharaoh Ahnk Ahnk.

An icon-based refinement of the movement system used in *Seven Cities* lets the gamer venture into late 19th century Africa. The explorer visits native settlements, collects information, and tramps through the countryside in the search for the elusive monument.

The most frequently heard complaint about *Heart of Africa* is that it's too easy. It's possible to blunder back and forth across Africa until the party stumbles on the tomb by mere chance instead of as a result of canny strategy.

The themes of action-strategy software aren't always as momentous as discovering America or defeating the forces of darkness. A touch of lightness can make the game more entertaining to casual players without diminishing its mental or physical stimulation.

Breakdance (Epyx) turns the dance craze into an anthology of action-strategy contests. Designer Steve Beck and his Becktech group have thoroughly analyzed the subject to create an authentic action-simulation of this torrid terpsichore.

All the mini-games share the same basic premise: the joystick-wielder duplicates the steps performed by on-screen animated breakers. The best version is the showdown between the Rocket Crew and the player. The gang of breakdancing punks boogies down a pier toward the lone challenger. If you don't ape the routine of each of the oncoming dancers in time, they push your surrogate right into the sea!

Gumball (Broderbund) is even more whimsical. As the foreman in a gumball manufacturing plant, you must make sure that the delicious spheroids roll down the right tubes to the appropriate sorting bins. After all, you wouldn't want to mix up the colors.

Gates located at crucial points on the production line govern the path of the individual gumballs. The goal is to sort the candy as quickly as possible without making a mistake. If you shunt the yellow gumballs into the green bin, for example, the boss strides onto the screen and trashes the mistakes.

Action-strategy games are thriving, despite the near-disappearance of pure action contests. Adult computerists who know they can't compete with youth's hairtrigger reflexes have gravitated to entertainments which offer the same high excitement level without making such stringent physical demands. The chance to compensate for fading reflexes by firing up the grey matter should continue to appeal to computer gamers, especially baby-boomers edging into middle age. □

to do with your ex-wife Rita and her lover Fred Mongo? Could the evil, drug-pushing doctor have decided you'd be better off permanently silenced? Or is the mob out to stop your investigation once and for all? The rickety file cabinet provides the first of many clues.

From its rock 'em-sock 'em opening, where players quickly learn to try the sorts of hair-raising stunts that would make Indiana Jones proud, to the real meat of the story, *Borrowed Time* packs a mean plot punch. The player starts out knowing nothing and gleans facts along the way by talking to various people and visiting different parts of the sprawling city. A pursuing goon squad compels the wise investigator to be ready for action at any time. The hoods do their talking with loaded .38's, so don't be too foolhardy, or you'll end up sleeping with the fishes.

Along the way, the detective meets a number of colorful characters who just might spill some information if the shamus handles them right. Among the detective's few real friends are Mavis, a barmaid with a heart of gold, and Hawkeye, a blind man with a blind dog who operates the local newsstand. Less friendly types populate the bars, and some houses, in the city.

The gameplay is vastly different than other mystery adventures, in that order entry relies more heavily on menus than on typing in commands with the keyboard. The illustrations sometimes offer visual clues, like an item you might like to examine more closely, or an object you can add to the inventory window by positioning the cursor over it and pressing the button. Shades of Macintosh; this adventure is really easy to play! Illustrated adventure purists can still type in "Get (object)," or can pick "Get" from the menu and type in the word they want.

A detailed, atmospheric picture appears for each location, and many are enlivened by small bits of animation. The player's inventory window at the top right side of the screen displays a small picture for each possession. Below that is a word menu, split into "verb" and "noun" sections, which gamers can use to eliminate typing in often-used words like "Get" and "Man."

The word lists are far from complete, though. They don't include every verb and noun that might be use-

ful, and the list of choices doesn't alter to conform to the situation at hand. For instance, "stairs" remains on the menu even when there are none around. Position the cursor over a word and press the button to automatically enter that word into the text window, saving a bit of key-banging.

Up to 10 games can be saved to disk and instantly restored, making *Borrowed Time* much less frustrating than programs which automatically close down when you make a wrong or fatal move. If you're not sure about any situation, just save the game one move at a time, as game 0, game 1, game 2, and so on, until you've figured out which of the many alternatives works. The disk access time is remarkably fast, so this won't interrupt playing enjoyment much.

The game is chock full of cute touches, like the way the telephone jiggles when it rings, or the drugged-out paranoiac who can't stop shaking. But while the graphics are good, they can be a bit confusing, especially if you aren't sure whether you're looking at a calendar or a desk blotter.

The text, written by Arnie Katz and Bill Kunkel (whose work often graces these very pages), is unusually good. It's more like an old-style detective magazine than a "normal" adventure story, though the plotting is far from linear. The plot can culminate in any number of ways, depending on what players do in the course of the game. Gamers will probably be tempted to replay the adventure just to see how many different endings they can coax from the program!

Borrowed Time is an absorbing, easy-to-learn mystery game that lets armchair detectives concentrate on its substantial plot, instead of on communicating with the program. Now if the designers could just put all possible options for each area in the word menu as each applies, the game would be better than an all-night Agatha Christie reading!

Activision, Drawer 7286, Mountain View, CA 94042 (phone: 415-960-0410). *—Tracie Forman Hines*

ACTIONAUTS
Advanced Program Technology
Commodore 64
Disk; No Price

During the heyday of the home videogame, one of the biggest-name designers was Rob Fulop. He didn't have quite the same visibility as current software stars, mostly because Atari didn't let him sign his work, but knowledgeable members of the joystick jury knew him well from his work on the home version of *Missile Command.*

And then came Imagic and the debut of *Demon Attack.* This Arcade-Award-winning multiphase shootout became one of the all-time best-sellers, because of its superb play-action and, for the time, highly innovative graphics.

Careers frequently develop in unexpected ways, though, and the demise of Imagic as a videograme cartridge publisher sent Fulop out of the entertainment arena. Advanced Program Technology is a provider of serious, high-powered programming technology. Like many such programming houses, it has enough work in its field of specialization to keep it from getting heavily involved in other areas, such as entertainment software.

When circumstances returned control of a computer game which he had previously developed to him, Fulop simply had no taste for the round of door-knocking needed to cut a deal and get the title distributed through normal channels. Fulop, the trailblazing non-conformist who put the first "Easter Egg" in a home electronic game, decided to try something new: Give it away.

As a result, *Actionauts* is obtainable in one of two ways. Subscribers to the disk edition of *Ahoy!* will receive *Actionauts* as part of this month's issue. Those who haven't hopped aboard the bandwagon can get a copy direct from Advanced Program Technology on the P.A.P. (pay-after-play) system. If you enjoy *Actionauts,* sent APT a few bucks and the debt of honor is paid in full.

Actionauts is less a game than a laboratory for amateur designers. The program presents a set of eight programable robots and a modifiable 7x9-square gameboard called the Gravity Grid. The computerist selects choices from onscreen menus with the joystick to customize every element and create new contests.

Probably the best way to become conversant with the relatively simple construction system is to work through the tutorial included in the 12-page documentation. It's a step-by-step recipe for a simple game of "tag" with the robots and grid. Once the basic operations are mastered, the sky's the limit, because each robot is fully programmable. You can establish its starting square, facing, physical appearance, and movement program for as many pieces as needed and, after trying out your concept in the test mode, quickly revise any aspect of your new game which doesn't work right.

Games (and individual pieces) can be saved to disk and reloaded as desired, so you can share your creations with other computerists. APT plans to send a newsletter, *The Actioneer,* to all owners which will contain plans for various games created with the program by fans.

Actionauts is a good-looking game. The gravity grid, presented in two-thirds perspective, fills most of the display. Its orientation makes it easy to follow the action when the robots swing into action in response to their preset orders. The programming menu is located at the bottom center of the screen, flanked by icons for selecting any of the eight robots.

The *Actionauts* playing pieces are also attractive and, more important, distinctive. Nothing kills the fun faster than having to pause the action while you try to figure out which piece is which. Lon Richter's graphics and animation are outstanding, and the inclusion of a white rabbit among all the mechanical men is a lovely bit of whimsy.

There's little question that *Actionauts* is the best game ever offered (legally) for free to the home computing audience. Unlike most public domain entertainment software, this is neither a half-finished attempt nor a technical curiosity. It is a well-designed, smooth playing and a lot of

mentally stimulating fun. It's a painless introduction to the rudiments of computer programming and an enjoyable computer toy in its own right.

Advanced Program Technology, P.O. Box 50246, Palo Alto, CA 94303. No phone. *–Arnie Katz*

SUPERMAN—THE GAME
First Star Software
Commodore 64
Disk; $29.95

It's been a long time since the Man of Steel visited the computer gaming screen, the last appearance by Krypton's favorite son being a 1980 cartridge for the Atari 2600.

In a sense, though, this new title is a throwback to the days when the joystick was all and hand-eye tests ruled supreme. Fernando Herrera's *Superman–The Game* is a multiphase action-strategy contest which heavily emphasizes the physical challenge.

Darkseid, a big-league badguy from Apokalips, is busily kidnapping Metropolis citizens to scour their minds for the secret of the Anti-Life Equation, which has been programmed into the unconscious minds of a few select Terrans. Superman must use his special powers to stop this alien attack.

The player, as either Superman or Darkseid, prowls the streets and underground labyrinths of Metropolis and faces five "combat zone" scenarios. These serve as qualifiers for access to the Metropolis screens.

The combat sequences are a series of basic videogames. In one, Superman battles wind currents and dodges laser blasts and ships as he flies down a Metropolis street, In another, Darkseid flies his Destroyer aircraft over the city and drops bombs which the Man of Steel must destroy in midair. Superman tries to breach a vertical tunnel which leads to the caves beneath Metropolis, while Darkseid launches Kryptonite boulders at him in a third scenario. There's a horizontally scrolling chase scene and one in which Superman must use his super-breath to blow fireballs back at the centrally located cannon which launched them.

The Metropolis screens are far more interesting, because they contain rudimentary strategic elements. As the hapless citizens of Metropolis wander the streets and caves, they can be "steered" by setting and resetting the 12 "deflector shields" located at appropriate intersections. Superman tries to save the people, while Darkseid attempts to drive them into his subterranean prison caves.

The shields also deflect Superman's heat vision and Darkseid's Omega Beams. Manipulating the spears of light as they bounce down the city's thoroughfares is the most entertaining aspect of the game.

The figure animation for Superman and Darkseid is excellent, but the backgrounds, especially in the combat zones, are unspectacular. At least one of the many mini-games is likely to catch the player's interest, but there's very little original or exciting in *Superman–The Game.* Only devoted readers of the Superman comic book are likely to be aware of Darkseid, and even those fans may find his role in the game at variance with his comic book reputation. This type of hand-to-hand villainy is more appropriate for someone like Lex Luthor, who would also have been far more recognizable.

The bottom line: *Superman–The Game* doesn't play faster than a speeding bullet, break new ground in gaming, or leap over other software in a single bound. It takes several halting steps, but never really gets off the ground.

First Star Software, 18 E. 41st Street, New York, NY 10017 (phone: 212-532-4666). *–Will Richardson*





Superman's *combat sequences are basic videogames. The Metropolis screens contain rudimentary strategic elements.*
READER SERVICE NO. 296

PANZER GRENADIER
Strategic Simulations
Commodore 64
Disk; $39.95

The main image most of us have of World War II German armored tactics is the blitzkrieg, the so-called lightning war. While these mechan-

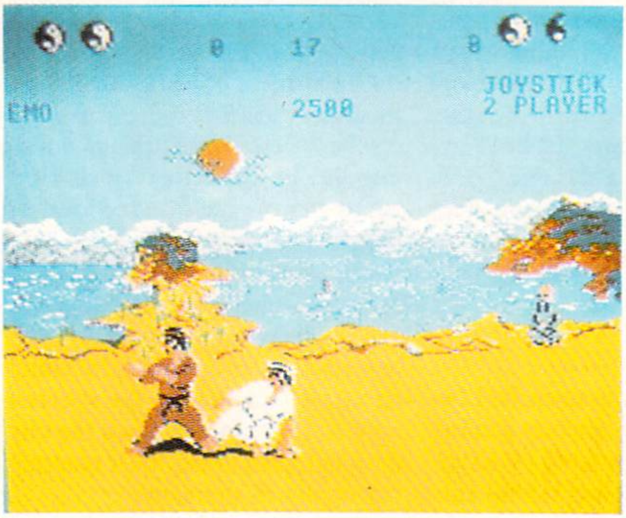


Panzer Grenadier *provides a choice between regular or fast play. The former slows enemy fire and movement to human speed and sends messages about hits and misses.*
READER SERVICE NO. 297

ized hammer blows are, indeed, typical of the early stages of the conflict, infantry didn't simply disappear from the battlefield.

In fact, it didn't take long for the various armies to discover that tanks without the support of foot soldiers became easy targets for infiltrating enemy troopers. The German panzer grenadier divisions (and Allied mechanized infantry units) were one answer to the problem. Because they included elements of both infantry and armor, the panzer grenadier divisions were combined-arms powerhouses in European campaigns.

Designer Roger Damon gives armchair generals the chance to explore the ramifications of the concept by refighting any of five scenarios, each 12-15 turns in length. All cast the gamer as a German commander on the Eastern Front in 1943-1944. This solitaire program puts the computerist on the front lines with units representing individual companies, platoons, and squads.



Kung Fu: The Way of the Exploding Fist *pits the gamer against an elite corps of fighters in a secret enclave near Okinawa. The sound level rises high when fists and feet are flying. READER SERVICE NO. 298*

There's always a big demand for military simulations which are easy to learn and stimulating to play. *Panzer Grenadier* fills the bill on both counts. Even novices will commit the multiphase routine-of-play to memory before the end of their first session, and the joystick-activated command control scheme keeps the action moving along at a brisk pace. An experienced wargamer can complete most of the scenarios in under an hour, and there's a "save" feature if available gaming time runs out before final victory.

Three levels of difficulty are offered for each scenario. The easiest is little more than an interactive tutorial, but the computer-directed Russians are mighty tenacious at the advanced level. There is also a choice between a regular or fast game. The former slows enemy fire and movement to human speed and presents individual messages concerning hits and misses. The fast mode eliminates the delay loops so that *Panzer Grenadier* plays even more quickly.

The visuals are serviceable, if less than eye-popping. The omnidirectional scrolling gameboard gives the computerist a good overview of the battlefield. The unit symbols are nothing special, but at least it's possible to distinguish among the unit types at a glance. The sounds of shot and shell accompany each assault.

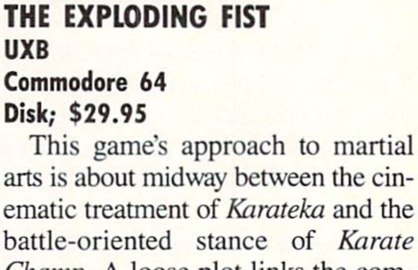
Panzer Grenadier covers the combined arms combat without resorting to hundreds of special-case rules. Roger Damon's keen sense of what's important in a military simulation has unerringly led him to create a game which is fun, accurate, and challenging.

Strategic Simulations, 883 Stierlin Rd., Building A-200, Mountain View, CA 94043-1983 (phone: 415-964-1200). *—Arnie Katz*

KUNG FU: THE WAY OF THE EXPLODING FIST
UXB
Commodore 64
Disk; $29.95

This game's approach to martial arts is about midway between the cinematic treatment of *Karateka* and the battle-oriented stance of *Karate Champ.* A loose plot links the combat, but each fight must be viewed as an end in itself rather than as stepping stones on the way to achieving a major goal.

The solitaire scenario puts the player in a life and death situation. The head of the "largest remaining Ninja sect" has brought you to a secret enclave on an island near Okinawa. Here, an elite corps of fighters challenge you to one-on-one combat.



Star Trek: *locate the Heinlein. READER SERVICE NO. 299*

Starting at "novice," the computerist must defeat two men at each level to advance to the 10th Dan. The winner of each battle is the fighter who first scores two full points. If time runs out, the built-in judge awards the round to the combatant who gave the better performance. Losing even one round ends the game, though pushing "f3" restarts the progression from the beginning. Needless to say, each time the armchair Bruce Lee ascends to the next Dan, the quality of the opposition also rises.

There is also a two-player version. This junks the story in favor of straightforward head-to-head competition. The player who scores highest in a series of four bouts is the winner.

The onscreen fighter is maneuvered with the joystick. The system employed is similar to, but not exactly like, the one used in *Karate Champ*. Some of the available moves are pretty flashy, like backward somersaults and flying kicks, and all are very nicely animated.

Learning the control system isn't too difficult. The documentation advises first-time players to select the two-player option and try all the moves against a passive target.

The sound is impressionistic. Suitably Oriental music, programmed by Neil Brennan, wails in the background, while stylized martial arts grunts and shouts punctuate each blow. This program can get pretty noisy when the fists and feet are really flying, so the designer has thoughtfully included a way to toggle the sound on and off as desired.

Kung-Fu: The Way of the Exploding Fist is an excellent start for a new software label, UXB. It presents a good balance of action and strategy and is one of the most visually exciting games published in the last year.

UXB, 1 Kendall Square, Cambridge, MA 02139 (phone: 617-494-1200). *–Arnie Katz*

STAR TREK: THE KOBAYASHI ALTERNATIVE

Simon & Schuster
Commodore 64
Disk; $39.95

Twenty years after the *Enterprise* first warped where "no man has gone before," an authentic recreation of the world of James T. Kirk and friends has finally reached the home computer screen. This entertainment is guaranteed to captivate "Star Trek" lovers everywhere. Forget the old arcade shoot-em-up; this text adventure actually lets the gamer become Capt. Kirk. The mission: To find a missing spaceship by following a winding trail of clues that sends the interstellar juggernaut on a galaxy-spanning trip to 10 strange worlds.

The Kobayashi Alternative, a plot motif clearly inspired by the training sequence in the first *Star Trek* feature film, is the Federation's latest Ultimate Test for would-be fleet officers. Unlike the original "no win" scenario, however, this one tests more than just the candidate's toughness in the face of a seemingly lost cause.

The cadet must role-play Admiral Kirk, the very model of a modern space navy superstar, in a situation designed to evoke the qualities of leadership, judgment, and resourcefulness the Federation esteems most. The only way out is to find the missing ship *Heinlein*. Kirk must effectively blend the disparate skills of the *Enterprise* crew and deal with the alien races he encounters while hopping from planet to planet.

The game-system introduced in *Star Trek* is a landmark advance for the text adventure *genre*. The parser isn't especially large compared to those used by Infocom and Synapse, but it is highly flexible and configured to promote a good level of interaction between Kirk and the nonplayer characters. In fact, it's generally simpler to order the appropriate crew member to perform a task than to try to do the job directly, since the program's vocabulary is not especially conducive to physical action.

Windows are the basic building blocks. Each character is represented by a window, which telescopes into view on the screen when Kirk addresses that individual. Other frames contain data such as the ship's current position and a description of the immediate surroundings. This makes it easy to keep track of who is speak-

ing at any given moment, and it also provides a lively display, as windows open and shut in response to the computerist's input.

It's a lot of fun to explore the ship and gab with the characters we've all followed through so many TV episodes, novels, and movies, but there isn't much freedom of action once the player leaves the security of the *Enterprise* for one of the adventure's numerous alien planets. Conversations with the natives in particular must conform to a narrow dialogue track. This makes potentially fascinating contacts between intelligent races rather cut-and-dried, because the aliens don't have very vivid personalities.

The same is true with regard to movement. Kirk has free run of the spaceship, but the choices are severely limited when a landing party beams down to a planet.

The plot would probably work well as the basis for a *Star Trek* script, but it makes for a fairly constrained game. To solve the mystery, the computerist is compelled to follow a single path in lock-step order. Sometimes, the twists and turns in the plot seem governed more by what the designer wants the computerist to do next than the dictates of logic. The story is quite absorbing, if linear, and it is bound to take many hours of interstellar sleuthing to bring Kirk and friends to the solution of the mystery of the missing ship.

Truthfully, the plot is secondary to the total gaming experience. *Star Trek: The Kobayashi Alternative* provides a unique chance to step into the space boots of the most famous science fiction hero of our time. Even after the computerist finds Sulu and the *Heinlein*, the fun is far from finished. The gamer can still travel through space aboard the *Enterprise*, experiment with its many features, and visit with the rest of the Star Trek luminaries on board. You don't have to be a pointy-eared trekkie to enjoy *Star Trek: The Kobayashi Alternative*, but you may become one after personally participating in the universe's longest five-year mission to explore the galaxy.

Simon & Schuster Computer Software, 1230 Avenue of the Americas, New York, NY 10020 (phone: 212-245-6400). *—Joyce Worley*

GAMEMAKER
Activision
Commodore 64/128
Disk; $39.95

Is there an ardent computer gamer with soul so dead that he or she has not fantasized about actually creating a game? It's hard to enjoy professional entertainment software without yearning to try one's own hand.

As almost anyone who succumbs to this temptation discovers in fairly short order, a "simple" action contest is a major undertaking. Even *Pitfall,* which is included on the "Library Disk" side of this program as a sample, would be far beyond the capabilities of most computer users.

It may be ego-deflating to admit this, but few of the knowledgeable Commodore users who read *Ahoy!* will ever design and code a professional-quality game. In a sense, that is as it should be. The people with genuine design talent carry the load for the rest of us. It would be sad if the only records, films, television shows, and paintings we could enjoy were ones we produced ourselves.

Garry Kitchen has answered the prayers of frustrated would-be electronic authors with this five-part system for writing entertainment software. Based on the plain-English computer language which Kitchen invented for his *Electronic Pencil* art program, *Gamemaker* is far more than the run-of-the-mill "construction kit."

Although it includes an extensive library of sprites, backgrounds, sounds, and music, this is more than a collection of parts boxes. A professional designer could use *Gamemaker* to produce a commercial-quality game, and even amateurs will be surprised and gratified at what imagination and practice can create with this powerful set of tools. An indication of Activision's faith is that the company is sponsoring a contest for the best design written with *Gamemaker* and will publish the winner.

There are five modules, each well-developed enough to stand on its own. *Gamemaker* is an application program which harnesses its components into a system for writing computer games.

Most people start with "SpriteMaker," which creates and animates characters and objects. The computerist can draw from scratch or pick stock images. Any sprite can be colored, revised, or reoriented as desired. A magnification feature permits pixel by pixel revision.

"SoundMaker" generates aural effects like explosions or the beating of a helicopter in flight. The computerist can shape any sound with the control panel.

"SceneMaker" furnishes a collection of game backdrops. The operator can incorporate all or part of any stock scene into a game, or customize the picture.

"MusicMaker" lets the designer write original songs or utilize any tune in the library. Three "voices" are available.

The "Editor," based on a menu of 90 joystick-selectable commands, puts the parts together. The construction process is similar to the method employed in *Computer Fireworks Celebration Kit.* It's not quite as simple as that earlier Activision title, but the methodology quickly becomes second-nature.

A joystick gives access to all functions. The user puts the onscreen pointer next to the desired selection and pushes the action button to lock in the choice. Moving the stick again runs through the possibilities. A second push of the button inputs the choice.

Don't expect to design the next megahit overnight. Even with such a powerful program, most computerists will have to work hard to achieve notable results. The fun, of course, is in trying. Garry Kitchen can't turn every Commodore owner into an electronic author, but his marvelous *Gamemaker* at least gives all of us a chance to try.

Activision, 2350 Bayshore Frontage Rd., Mountain View, CA 94043 (phone: 415-960-0410). *—Arnie Katz*

FLANKSPEED LISTING CREATOR

For the C-64

By Gordon F. Wheat

Flankspeed Listing Creator will allow you to generate a hard copy listing in *Flankspeed* format of a machine language program resident in memory. (If you're unfamiliar with the *Flankspeed* machine language entry program which has appeared in *Ahoy!* since our February 1985 issue, it allows you to enter machine language programs error-free as hexadecimal data. See page 106 for more about *Flankspeed.*)

When you run the *Flankspeed Listing Creator*, the program will prompt you for the name of the machine language program to be output, the SYS to Start in decimal, and the starting and ending addresses in hex.

Before you run the program, make sure that the printer is connected properly. Output produced by the program will appear exactly as a *Flankspeed* listing, with each line's checksum appearing in the ninth column.

This program circumvents the time-consuming process of using a machine language monitor to view the contents of an ML program in memory. *Flankspeed Listing Creator* can even be used to submit a machine language program listing to *Ahoy!* □

SEE PROGRAM LISTING ON PAGE 129

NOTEMAKER

For the C-64

By Tim Gerchmez

Notemaker is a utility program that creates auto-booting disk "notes." It gives you a full screen on which to create a note, with each note occupying eight disk blocks.

When you run *Notemaker*, it will ask you for the filename of the program you wish to document. Following this, the screen will clear, and you will see a flashing cursor. Type anything you like on the screen, using the normal cursor controls and editing keys. To advance a line, press SHIFT-RETURN. Be sure to set the cursor color you want, as this color will be saved along with the note. When you are done typing the note, insert the disk you want to put the note on and press RETURN. The program will save the note as the chosen filename with a ".N" appended onto the end. To load a note documenting a particular program, just type LOAD "PROGRAMNAME.N",8,1. Don't forget the ,1 at the end of the LOAD command. If the directory was in memory before the note was loaded, it will still be there—just type LIST.

If you are like me, you will find *Notemaker* to be a convenient and useful addition to your software library. Disk notes provide a quick and easy way to document a program, and a convenient way to remember just what a program does. □

SEE PROGRAM LISTING ON PAGE 128

ERRATA

Crabfight (Feb. '86)

The last byte of line C680 on page 117 should read 2E.

Ahoy!Term 128 (Mar. '86)

If you entered *Ahoy!Term* in 64 mode, you will get a SYNTAX ERROR in both 64 and 128 modes when you try to run the program. If you wish to run the program in 128 mode but have typed it in C-64 mode, you must load the program in 128 mode and reenter line 30. After that line has been reentered, remember to resave the program. Also, in line 1410, the command NEW should be DIRECTORY.

Gypsy Starship (Dec. '85)

Many readers complained of a "STRING TOO LONG ERROR?" in line 2130 of the GYPSY program. In most cases, this resulted from readers' naming the program PLANET SETUP as GYPSY PLANETS; and as this would cause erroneous data to be read in by the GYPSY program, the error would appear in GYPSY.

Protecto (March '86)

The Protecto advertisement on page 24 for monitor, disk drive, and keyboard cleaners listed a price of $17.50 for shipping, handling, and insurance. The correct fee is $3.00.



I don't like computer terror, but, okay! I'll contribute to your user group!

SWOOP

For the C-64

By Tony Brantner

Swoop is an arcade-style shoot 'em up which pits you and your laser cannon against wave after wave of winged maniacs bent on destroying you at all costs.

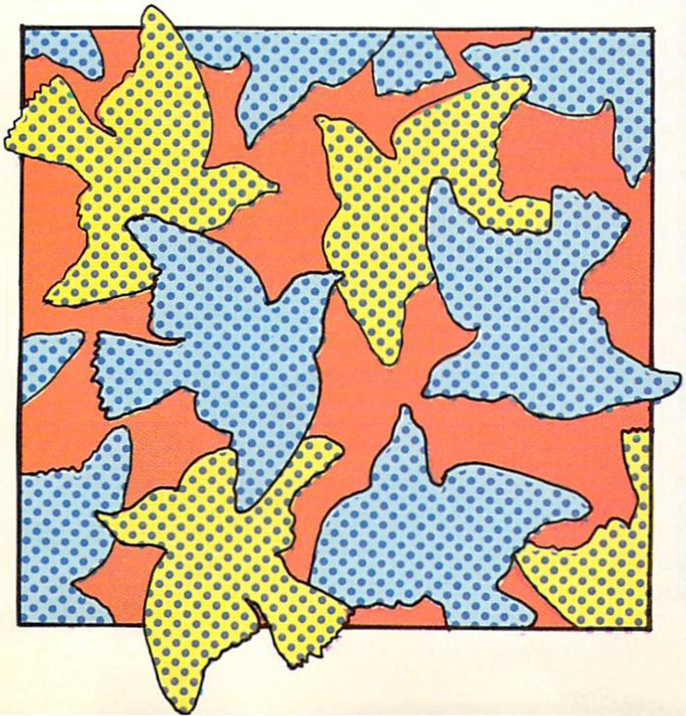
Be sure to have a joystick plugged into Port 2 before starting the game. The first thing you will notice is a blinking cannon at the bottom of the screen. At this point, grab your joystick and get ready. You'll then see the enemy descend onto the screen from above, setting themselves in formation before the attack. Don't let their methodical movement fool you at this point however, because once in line, their flight pattern becomes completely unpredictable.

It isn't bad enough that those lunatics are trying to destroy your cannon by diving into it, but they also drop twin laser beams which can blow you to bits. Use the joystick to move left or right and press the fire button to shoot a laser beam of your own which destroys anything in its path.

There are 13 levels in all, and each successful shot is worth 10 points multiplied by the level you are on. You start out with three lives, and an extra life is awarded every 1000 points for a maximum of nine in reserve. The game also keeps track of your highest score. Any time you need a break, press the SHIFT-LOCK key to freeze the action.

You'll have to keep that cannon moving if you want to stay alive. Just remember that there's plenty of room to run, but no place to hide. □

SEE PROGRAM LISTING ON PAGE 123



SCREEN WINDOW

For the C-64

By Mike Grotton

Have you ever been in the middle of typing in a program when you had to go back and change something...you had to list the necessary lines, right? Or forgotten what value or name you lent to an important variable...had to list it, right? After awhile all that listing takes its toll on you and you start wishing you could just make the line you wanted appear by magic.

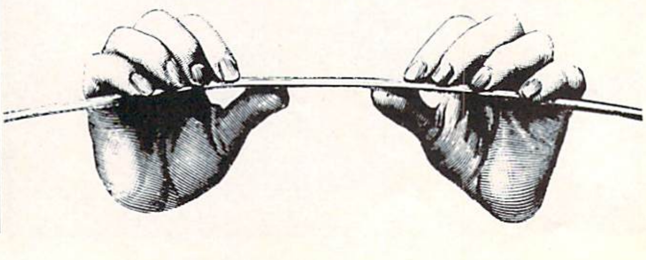
Screen Window provides just that magic by giving you the ability to page up or down through your BASIC program. It also adds a handy search function.

First let's get into how to use the screen scrolling. Type in the *Screen Window* BASIC loader on page 116. Once *Screen Window* is through loading into memory, it will print the command to start it up: SYS 49152, at the top left hand corner of the screen, so that all you have to do is hit the CLR HOME key followed by RETURN. Now load in your program and let it list. Here is where you start taking advantage of *Screen Window.* If you want to page down, to the higher line numbers, hold down the CRSR DOWN key. When you reach the bottom of the screen the program in memory will magically flow up the screen until you release the key. Use CRSR UP to do the same for scrolling up, counting down the line numbers.

To use the search function, hit CLR HOME followed by f1. The words 'SEARCH FOR:' will appear on the screen. At this time enter the command or string that you would like to find, and *Screen Window* will find the first line that contains such a command and print it onscreen, preceded by the line before it and followed by the line after it. If you didn't find what you want, hit f3 and the program will search for the next occurrence of the command or string (or variable).

I have found this program an invaluable aid. It is even compatible with the DOS Wedge included with your 1541 drive! If anyone would like to discuss any problems with *Screen Window,* I can be reached care of *Ahoy!* □

SEE PROGRAM LISTING ON PAGE 116

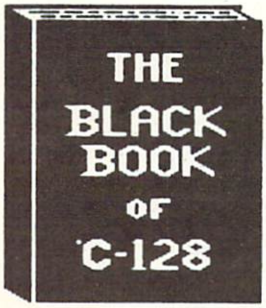


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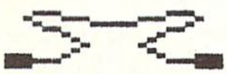
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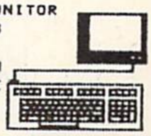
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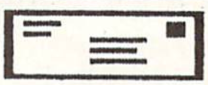
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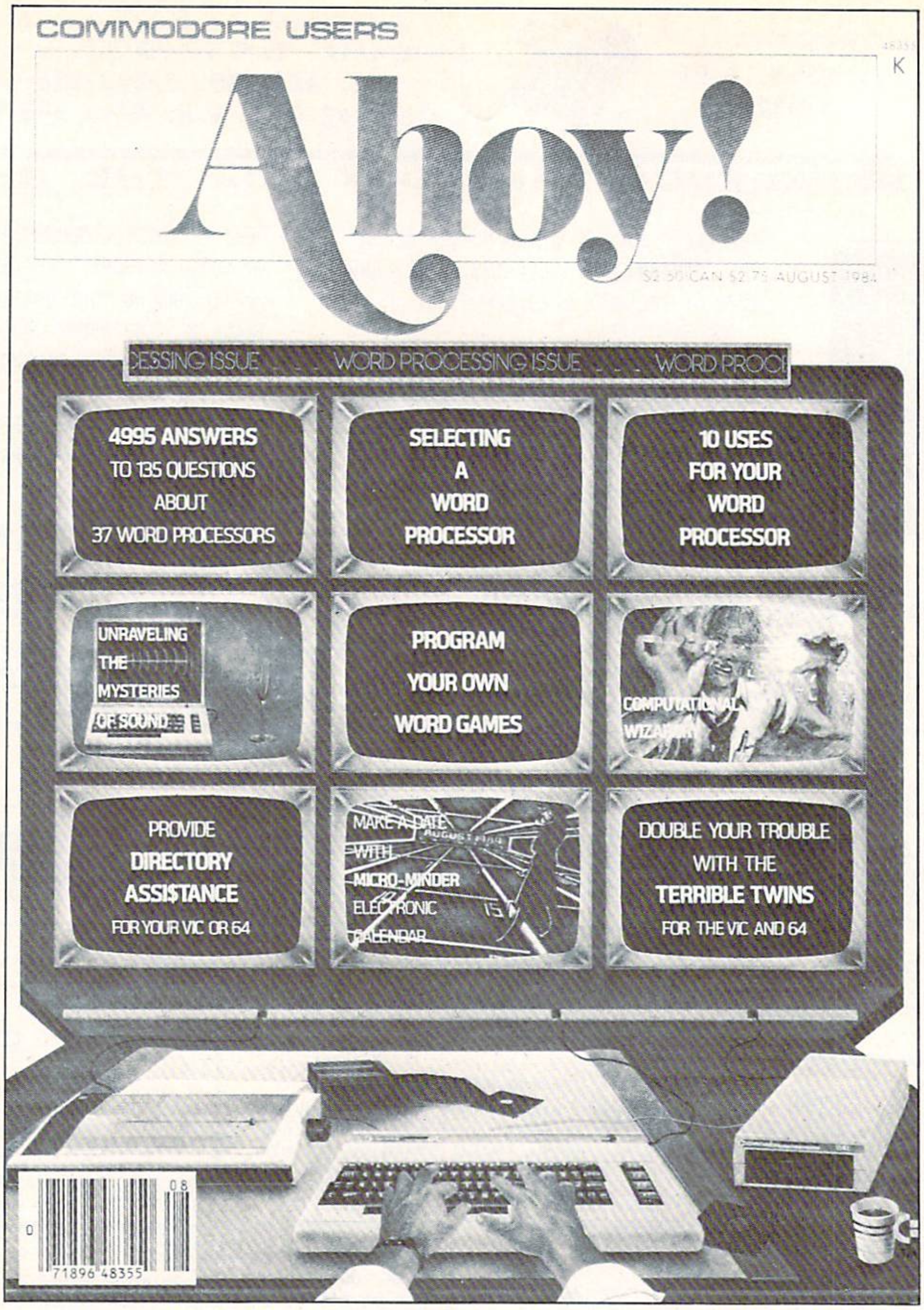
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HIDDEN CAVERN

For the C-64

By James C. Hilty

In a far away land there exists a long and winding cavern. The cavern has remained unexplored over the ages, for it is rumored to be the home of the never before seen Cave Globs. As a scientist, you feel it is your duty to enter the cavern and find these fabled monsters. You will fly through the cavern in your cave cruiser, a fast moving vehicle equipped with stun torpedoes.

Upon entering the cavern you see huge stalagmites protruding from the ceiling and floor. Hitting one of these will blow up your cruiser. Fearlessly you begin flying through the cavern, gradually moving faster and faster. Suddenly you notice two Cave Globs roaming around—one red and one blue. If either hits your cruiser the radiation will blow your ship to pieces. To keep the creatures back, you must shoot them with your stun torpedoes. You continue flying through the cavern, moving faster and trying to avoid the stalagmites and Cave Globs. How long can you keep going?

This is the scenario of *Hidden Cavern.* The playing field consists of your white cave cruiser, red and blue Cave Globs, and a scrolling cavern made up of custom characters and sprites to give true three dimensional movement.

RULES OF THE GAME

A joystick allows you to control vertical movement of the cave cruiser. You have three cruisers at your disposal at the start of the game. The fire button fires a stun torpedo. You have an unlimited supply of torpedoes, but beware missing a Cave Glob with a torpedo counts as a missed shot, and three missed shots ends a game. Hitting a stalagmite or a Glob costs you a ship. Once you lose three ships, the game is over. The score, ships, and missed shots are displayed at the top of the screen. You get points just for flying safely through the cavern. Bonus points are earned for hitting a Cave Glob with a torpedo.

THE CAVERN

When you travel in a car you will notice that objects far away from you move slower than objects close to you. This is the effect used in the design of the cavern. Commodore character shapes are used to form the stalagmites which are closer to you, the player watching the screen. Sprites form the stalagmites further away from you. The screen characters are scrolled at one speed and the sprites which form stalagmites are scrolled (or set in motion) at a slower speed. Giving screen characters priority over the cavern sprites gives the effect of a moving cavern in three dimensions. It also creates the illusion of an ever-changing cavern.

THE CAVE GLOBS

The Cave Globs are sprites which move in different directions. It is hard for the player to get a bead on where they are coming from. At times they are not even on the screen. Hitting one with a torpedo sets both of them spinning and gives you 250 points. The Globs are animated by POKEing new sprite definition values into their sprite register. Eight sprites and nine sprite shapes are used in *Hidden Cavern*. Two sprites are Cave Globs, one is the cruiser, one is the torpedo, and four are used in forming the cavern.

SPEED AND ACTION

In order to keep the game moving fast an interrupt routine moves all the sprites. The joystick routine is a combination of the interrupt routine, and BASIC using flags to POKE different values into the interrupt routine. A machine language routine is accessed from BASIC using the SYS command to scroll the screen. Another method used to keep the game moving quickly is to keep the main loop very tight. Even though *Hidden Cavern* is fairly long, the main loop is very short (lines 200 to 220). All the collision routines are subroutines, called upon only when needed.

Background sounds and sound effects help to accent the various actions which occur in the game.

Do you dare enter the *Hidden Cavern*? Remember, the cavern moves slow at first, doubles in speed after you reach 250 points, and triples in speed after you reach 2500 points. Don't get so caught up in your flying that you forget...the Cave Globs!

SEE PROGRAM LISTING ON PAGE 108

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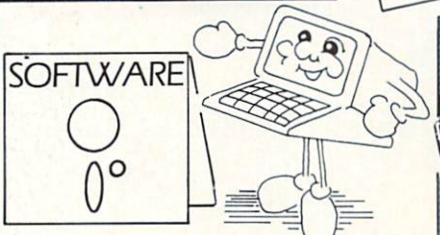
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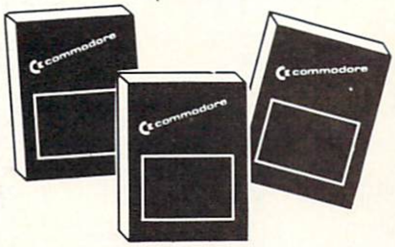
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CHRONO-WEDGE

Date and Time Stamping For The 1541

By Dennis Muscatelli

The software engineers at Commodore gave us a powerful tool when they wrote the DOS for the 1541 disk drive. Using special instructions found in the machine code that constitutes part of the disk operating system resident in ROM, the 1541 is able to store a relatively large amount of data on a single side of a diskette. This same disk operating system allows you to create and utilize relative file structures, a feature not found on some more expensive drives. But for all the power of this DOS, one feature is sadly missing: date and time stamping.

Date and time stamping functions something like this: When a file is written to disk, the disk operating system writes some additional information to special areas of the disk. This information usually consists of the current time and the current date. Some systems maintain additional information such as creation date and/or last update. When a directory of the disk is displayed, some or all of this information is shown for each of the files on the disk.

As I mentioned, the 1541 does not support date and time stamping directly. If you own a C-128, and are using CP/M 3.0, you are provided with these capabilities. This is possible because part of the CP/M operating system (namely BDOS) manages a special type of directory aside and separate from that produced by the 1541 DOS ROMs.

Up until now if you wanted anything remotely similar to date and time stamping you had to use your imagination when dreaming up a filename. Something like this comes to mind:

FUZY-FILEV1-12/3

Directory listings then could look like this:

```
23 "FUZY-FILEV1-12/3"   PRG
21 "FUZY-FILEV3-12/6"   PRG
12 "FUZY-FILEV2-12/6"   PRG
         etc.
```

Chrono-Wedge will now allow you to give your imagination that much-needed rest. This program is a specialized form of the standard DOS wedge that supports date and time stamping directly. Unlike some other more primitive methods, *Chrono-Wedge* does not modify any file on the disk. Instead, certain unused areas of the directory track are used to store date-stamp information. When a program is saved using the *Chrono-Wedge* save command, a date and time stamp is automatically written to these special areas of the directory. *Chrono-Wedge* also provides you with the means to date-stamp any file that is on the diskette regardless of type or origin. This allows you save machine language programs with a monitor and then date-stamp them with *Chrono-Wedge*. These date-stamps will not interfere with other programs that read or write to the diskette and will not affect the normal operation of your disk drive.

Chrono-Wedge produces a directory listing similar in content to that produced by other wedges. In addition, the listing will include a date and time stamp for any file that was saved to disk or date-stamped with the *Chrono-Wedge* system. This allows you to maintain a chronological record of the files found on any diskette in your library! Now if you want to see which copy of "FUZY-FILE" you were working on last Wednesday, merely list a directory and look for the copy of that program that bears last Wednesday's date. What could be simpler?

GETTING STARTED

Type in the *Chrono-Wedge* listing on page 125 and save a copy on disk before attempting to run the program. When you have a copy saved to disk, clear your C-64 by turning it off and back on. Now load the *Chrono-Wedge* program by typing:

```
LOAD "CHRONO-WEDGE",8,1 <RETURN>
```

When the program has finished loading type "NEW" <RETURN> and then SYS 49152 <RETURN>. You will be greeted by a sign on message followed by the current date and time. When you first run the Chrono-Wedge program, this date and time will be inaccurate. You will next be prompted to enter the correct date and time. The prompts and correct range of response are listed below.

PROMPT	RESPONSE/RANGE
AM or PM	"A", "B", or RETURN
CURRENT HOURS	"01" through "12"
CURRENT MINUTES	"00" through "59"
CURRENT MONTH	"01" through "12"
CURRENT DAY	"01" through "31"

When you have answered all the prompts the screen will be cleared and you will be ready to use *Chrono-Wedge*.

CHRONO-WEDGE COMMANDS

Chrono-Wedge includes most of the standard DOS commands as well as a few new ones. A list appears at the top of the next page.

@ - Read disk error channel and return message.
@$ - Display directory (wildcard use supported).
Format is "@$:* or @$:??---
Space bar pauses, STOP key aborts.
/ - Load a program to start of BASIC.
% - Load a program using header address.
< - Save program at start of BASIC
Filename must be prefixed with "O:"
Load and run BASIC program
Automatically disconnects *Chrono-Wedge*.
@Q - Disconnect *Chrono-Wedge*.
@T - Display/Edit current date and time.
! - Write date and time stamp on file.
@D - Log drive.
@P - Spool to printer.

The last four commands require some explanation. The "@T" command will display the current date and time and allow you to change them. The prompts listed above will be displayed. If you wish to alter the current date and time, respond to the prompts with the appropriate response. If you do not wish to alter the current settings of date and time merely press <RETURN> at the "AM OR PM" prompt.

The "!" command allows you to write a date and time stamp to any file that is already on the diskette. You may use this command directly on a directory listing or alone on a single filename. For example, both

```
!"FUZZY-FILE" & !FUZZY-FILE
```

are legal. The use of quotes is optional. The current values of date and time will then be stamped to disk for the filename given.

"The "@D" command allows *Chrono-Wedge* to communicate with more than one drive. The command is followed by an "8" or "9" to indicate which drive will be logged. Only devices 8 or 9 are considered valid. Once a device has been logged with this command, all future communications will be with that drive. To communicate with the alternate drive it must be logged with the "@D" command. Note that this command does *not* change the actual device number of your drive. Instead, it merely informs *Chrono-Wedge* that you wish to communicate with an alternate disk drive.

The "@P" command followed by a number allows you to select a printer device on the serial bus. Valid device numbers are limited to 4 and 5. After selecting a printer with this command, you may print a directory listing by issuing the "@$" command. This allows you to get hard copies of the date-stamped directories produced with *Chrono-Wedge*! After the listing has been produced, the printer is disconnected.

Lastly, you will notice that at the completion of any command *Chrono-Wedge* will automatically read and display the status of the currently logged disk. A message similar to the following will be displayed:

```
DISK-(n): 00,OK,00,00
```

The "n" in the above example will be 8 or 9 depending on which drive was logged.

A CHRONO-WEDGE DIRECTORY LISTING

An example directory listing produced with *Chrono-Wedge* is shown here:

```
---------------------------------------
DISK: TESTDISK            ,TD DOS VER= 2A
FILENAME              TYP BLK LAST UPDATE
---------------------------------------

 "TESTFILE"           PRG  12 08:30 11/05
 "FUZZYFILE"         >PRG 100 22:12 10/19
 "INSTRUCTIONS"       SEQ  61 --:-- --/--
 "SOME STUFF"         PRG   5 --:-- --/--
 "OTHER STUFF"        PRG   3 11:17 12/01
 "EVEN MORE STUFF"    PRG  12 --:-- --/--

400 BLOCKS FREE.
```

Under the field labeled "LAST UPDATE" you will find date and time stamp information for the respective file listed on the left. If the file has not been stamped, dashes will be displayed in place of the missing information. Time, using a 24 hour clock format, is listed first followed by the date which consists of month and day. Year information is not maintained by the *Chrono-Wedge* system due to the limited directory space available for date stamps. For most applications this should present no problem.

The bracket character, if present to the left of a filetype, indicates that the file has been locked and is protected from accidental deletion. Some programs, like my *DOS Plus* published in the May 1985 *Ahoy!*, provides you with the capability to lock and unlock files.

You will notice a single space just to the left of the opening quote for each directory entry. This is provided so that you may use any of the single character commands directly on a *Chrono-Wedge* directory listing.

Well, there you have it—workable date and time stamping on the 1541. Use it and give your overworked imagination a rest! Who knows, after a sufficient rest, perhaps you'll be able to conjure up a way to add a year field to the date stamp...☐

SEE PROGRAM LISTING ON PAGE 125

KIDS AMERICA

Ahoy! is pleased to congratulate Barry Kennedy, Gavin McKiernan, Fran Warner and Christina Tsatsakos, winners of subscriptions to *Ahoy!* courtesy of the *Kids America* radio program. Check your local AM and PM listings for time and station.

Kids Computer News, featuring reviews of software by *Kids America* listeners, is now available. For subscription information, contact Thomas F. Trocco, St. Hilda's & St. Hugh's School, 619 West 114th Street, New York, NY 10025.

REVIEWS

QUANTUMLINK PERSONAL COMPUTER NETWORK
Quantum Computer Services, Inc.
Commodore 64
$9.95 per month

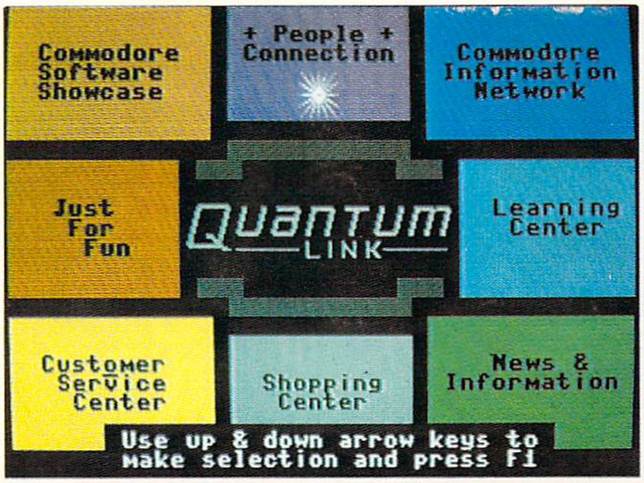
QuantumLink is a computer network designed especially for C-64 and C-128 users. Through the Q-Link interface, computerists go online to converse with other members, access the service's features, and attend conferences and meetings. The base price is $9.95 per month, and the online charge is 6¢ per minute for those services that are not free.

Q-Link gives each member an hour of free time each month before extra charges start. As a further saving, an offer gives a free modem with a four-month subscription.

Anyone with a C-64 or C-128 computer, disk drive, modem, and telephone can join. To log on, the user disconnects all joysticks and removes cartridges, inserts the modem into the computer, loads the program, and follows the onscreen instructions. In most areas, the service uses a local telephone number, which controls the cost.

There are lots of things to do for free. No-cost features include the Customer Service Center, the Q-Link calendar of news and events, and a suggestion box. Q-Linkers can teleshop, receive news and weather reports from *USA Today,* consult the Academic American Encyclopaedia, participate in surveys and opinion polls, and browse the Electronic University catalog before enrolling in online classes. Also included is the Just For Fun Department, which contains a Pro Football Picks contest, trivia quizzes, soap opera summaries, music news, movie reviews, and even a Hollywood gossip column. The Information Network answers questions about computing.

Shoppers can make unlimited use of the Commodore Software Finder, a comprehensive catalog which describes software programs that can be ordered, and Comp-U-Store, a veritable electronic mall full of goods and services for sale. There are also Music Finder and Book Finder services. Q-Link prints bestseller charts and helps users locate hard-to-find publications.



The Quantum-Link network is divided into the eight sections shown, providing news, software, onscreen classes, contests, shopping, telegaming, and other services. READER SERVICE NO. 289

Not everything is included in the basic membership price, of course. Pay services include talking to other members online, transferring files, special interest group discussions, head-to-head online games, and electronic mail.

The service is especially easy to use, a plus for novice telecommunicators. Every step of the signing on process is cued by onscreen prompts in plain English. Quantum Computer Services also maintains a toll-free Customer Service Line so members can talk phone-to-phone with a sympathetic human who'll answer questions and help solve any problems.

Helpers are always available to make the experience easy and fun for less experienced computerists. This group of charmers, called Q-Guides, stay online through the night. They are quick with a line of cheery patter to brighten an evening and keep a concerned eye out for questions from Q-Linkers.

The service is divided into eight departments. The Commodore Software Showcase contains an exhaustive software catalog for browsing, public domain software which can be downloaded onto disks for later play, and a simple system to transfer files from person to person. It also contains software previews of newly released programs by major publishers. These give users a taste of the product, so they can choose what they want to purchase.

Just For Fun has contests, quizzes, and entertainment news. The Customer Service Center takes care of any nuts-and-bolts information, including account and billing information so users can keep an eye on their tab. The Shopping Center contains the Software Finder, and lets Linkers access Comp-U-Store OnLine.

The Commodore Information Network contains information for new users – the system contains a guided tour that explains everything thoroughly. CIN also holds the weekly calendar of events, information on clubs and special interest groups, online computer experts for hacker help, message boards, and forums.

Learning Center holds the Electronic University Catalog for browsers. Once they've chosen a course of study Q-Linkers can enroll and attend onscreen classes. The Academic American Encyclopaedia is a useful tool for research; it's so easy to use that students should enjoy looking up items on the computer.

News & Information contains the *USA Today* Evening Update, a daily report of news and weather. Discussion forums and public opinion quizzes round out this section.

People Connection is for online

...Announcing

THE
COMMODORE USERS

Ahoy! Access Club!







An incredible offer from the publishers of *Ahoy!*...The **Ahoy! Access Club.** The **Ahoy! Access Club** offers members: discounts, rebates, coupons on products and services for your Commodore, a Commodore calendar of events, and much, much more! Members will also receive "The Clipper," an exclusive bi-monthly news bulletin. But the best thing about the **Ahoy! Access Club** is that it's **FREE!** to all *Ahoy!* subscribers. Subscribe today! and along with your first issue of *Ahoy!* you'll receive your official **Ahoy! Access Club** membership card...your ticket to super savings and bonuses you can only get from *Ahoy!* Don't miss out on this fantastic offer. The **Ahoy! Access Club**...if you own a Commodore — this club is for you!

THE COMMODORE MAGAZINE THAT OFFERS YOU MORE

chatter, telegaming, and special events in the auditorium. Linkers send and receive private messages and challenge each other to Hangman, Chess, Checkers, Bridge, Backgammon, and other two-player contests.

QuantumLink hours are 6:00 p.m. (local time) to 7:00 a.m. on weekdays, and 24 hours a day on weekends and holidays. Teenage members predominate in the early evening, but adults take over as the night progresses.

Q-Linkers can use up to five different names, and can also change user handles as often as they wish. This is great for families, and also adds to the fun for individual computerists. Members can set up special conversation rooms online to form impromptu discussion groups.

It's a friendly group. It's currently only for Commodore owners (though Q-Link will add the Amiga and Apple later this year), so there's a clublike atmosphere. Since Q-Link has only existed for a few months, it's smaller than some of the other telecommunication services. This has disadvantages, of course, in that there aren't yet as many activities available as other groups may have. But Q-Link is adding more clubs, special interest groups, and new features on an almost-weekly basis.

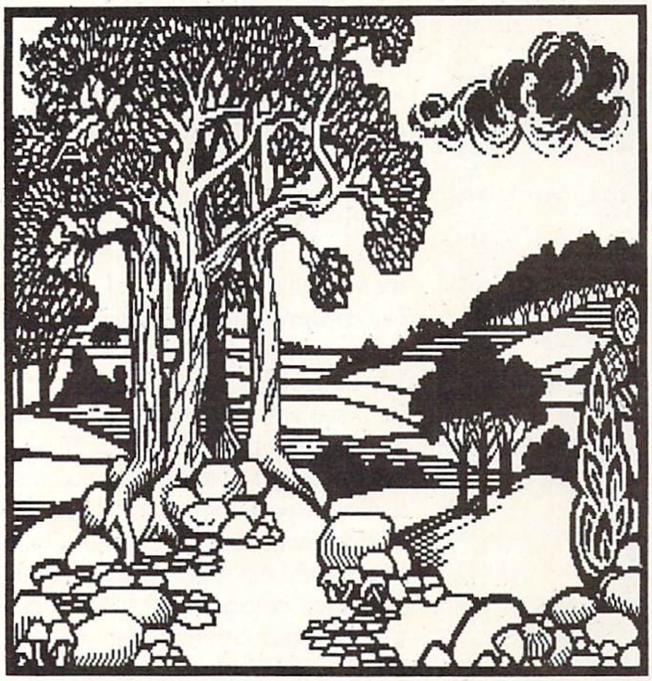
QuantumLink's prospects look good. Through an arrangement with Commodore, QuantumLink Computer Services is receiving considerable marketing help to establish it as *the* link for Commodore users. This means the service is bound to grow. It is relatively inexpensive, and the excellent online and over-the-phone help makes QuantumLink pleasant to use for either novices or experienced telecommunicators.

Quantum Computer Services, Inc., 8620 Westwood Center Drive, Vienna, VA 22180 (phone: 703-448-8700 or 800-392-8200). *—Joyce Worley*

SCREEN DUMP UTILITIES FOR THE C-64

By Morton Kevelson and Richard Herring

A permanent paper copy of the computer's screen display can be of great benefit. On the pages following we present several utilities for just this purpose. Two of these allow you to print anything which may appear on the screen. One even takes into account the original image colors in the final printout. We also examine a graphics tool that will allow you to blow up your favorite graphics creations to the proportions that you feel they deserve.



Left: **Screen Dump, Etc.** *generates a dot-for-dot bit map of original image. Shown is a double-size dump of Middle Earth by Wayne Schmidt. READER SERVICE NO. 150*
Below: Hi-res bitmap dump generated by **Hard-Copy,** *preserving tonal relationship of original display colors. READER SERVICE NO. 151*



READER SERVICE INDEX

The publisher cannot assume responsibility for errors in the above listing.

HARDCOPY
FS! Software
Commodore 64
Disk; $29.95

Visual stimulation is an important part of the C-64 user environment. To this end the computer is endowed with both textual and graphic display capabilities. The video display is an ideal medium for constantly varying user interaction. From our standpoint, the screen may be instantaneously updated as required. Along with this ease of revision comes the transitory nature of the screen display. Any information thus presented is irretrievably lost when the system is shut down. *HardCopy* from FS! Software endows the screen display with long term durability in the form of a permanent printout on your dot matrix printer.

HardCopy belongs to that class of utility known as a screen dump. However, it adds substantial refinement to that mundane task. First, it is a triggered dump in that it remains in the quiescent state till stimulated into action by a unique cue. Secondly, its installation is flexible, providing for compatibility with many applications. The total installed code requires a mere two kilobytes of the C-64's RAM space. Finally, it has the ability to preserve the tonal gradation of the 16 screen colors by means of a customized translation to gray scale dot patterns. Full color printouts are also possible if an Epson JX80 is on hand.

The first time you use *HardCopy* you will be prompted through a detailed installation procedure. The purpose of this is to customize the program to the requirements of your particular printer. Most users will do this only once, although the process may be repeated as often as necessary. Ten printers are directly provided for, as listed. Additional printers are likely to be added at irregular intervals. If your printer is not covered a customization procedure can be used.

The Install program is simple to use, as defaults are provided for the most likely selections. After printer and interface selection you have the option of modifying the gray scale dot patterns. There will be up to four sets of these patterns, as *HardCopy* will produce single density dumps with all printers and double density dumps with those printers able to handle it.

Unique pattern sets are provided for the high resolution and multicolor bit map screens. This is a basic requirement, since the two displays are fundamentally different. The former is composed of a grid of 320 by 200 pixels. The latter has only 160 by 200 pixels.

Printers Supported by HardCopy

Epson
Gemini 10X/15X
C. Itoh 8510/NEC 8023
Commodore 1525/MPS 801
Commodore 1526
Blue Chip
Mannesman Talley
Axiom
Okidata
Epson JX80 (color)

You may also choose a color separation option. In this mode one color will be printed as solid black while all other hues are ignored. The manual refers to this as a graphic artist's option.

When LOADing *HardCopy* you are presented with four options as to the program's final residence. The first two are at the top of BASIC's program area with and without expansion cartridges ($7800-$7FFF versus $9800-$9FFF). A pair of manually entered POKEs are required to protect *HardCopy* from being overwritten by BASIC's normal operations in this range. The remaining spaces are in the lower and upper halves of the $C000 block, a "natural" resting place for machine language routines in the C-64.

HardCopy's functions are initiated by simultaneously pressing the CTRL, COMMODORE, and SHIFT keys (single-handed, two-fingered computerists take note). Three types of dumps are possible, each triggered by the release of any of the aforementioned keys after all three have been held down for a timed interval.

An initial depression of less than one second yields a bit-for-bit representation of the current screen image. This is best suited for text screens,

as no consideration is given for color by gray scale shading. The resulting image is 5¼ by 2¾ inches with a Gemini 10X printer.

Holding the keys for more than one but less than three seconds triggers a single density gray scale dump. The size of the image with the Gemini 10X is 8⅛ by 5¾ inches. Note that image size will vary with the printer in use.

The gray scale pixel patterns will also vary depending on the original image type as well as printer. The 1525 and C Itoh printers use a two by three dot pattern for hi-res and a four by three pattern for multicolor single density dumps. The Gemini 10X works with a two by two and four by two pattern.

If your printer can handle it, a key press greater than five seconds triggers a double density dump. The size of the resulting image is the same as for the single density dump; however, the tonal range is extended. In this mode the full range of 16 colors may be uniquely translated to shades of gray. With the Gemini 10X the dot patterns are two by four and four by four. The C. Itoh manages patterns of two by six and four by six. The last ratio allows for up to 25 shades of gray.

In the event that the keypress trigger cannot be used, *HardCopy* may be started by a SYS from BASIC.

If you have an Epson JX80, *HardCopy* will produce a well-defined true color screen dump on it. The JX80 uses a four-color nylon ribbon for the printing process. We have not had the opportunity to exercise this feature ourselves. However, we have seen Don French, the proprietor of FS! Software, demonstrate the process at more than one Commodore fete. At the last World of Commodore, Don was seen thoughtfully eyeing a Canon PJ-1080 color inkjet printer in a neighboring booth.

The latest release of *HardCopy* includes a stand-alone *DOODLE!* to *Print Shop* conversion utility. This program, written by Wayne Schmidt, supports bilateral transfer of the *Print Shop Graphic Editor* files (only in non-Commodore format) to *DOODLE!* files. Up to nine *Print Shop* graphics, in three different layouts, may be transferred to a single *DOODLE!* screen.

The experienced user will recognize that *HardCopy* provides for considerable screen dump flexibility. The ability to adjust gray scale patterns as well as the "graphic-artist" option offer considerable margin for artistic expression. If you own more than one type of printer, or a non-Commodore printer with a graphic interface capable of 1525 emulation, you may experiment with additional varieties of dump patterns.

The dump operation is fast, with a minimum of time spent on "thinking" while composing the gray scale patterns. Detection of the type screen on display is totally automatic and transparent to the original program's operation. The minimal memory requirements will insure compatibility with much existing software.

The limitation to all this flexibility is the need to rerun the Install procedure for each variation, a process which takes several minutes. This in itself would not be a significant drawback were it not that the original program disk is copy protected. This makes it impossible to save custom versions of *HardCopy* on different disks. Furthermore, each update of Install replaces the parameter file on the original program disk. In view of the volatility of magnetic media we consider this a serious drawback for this type of utility. We are also puzzled by this approach to copy protection in view of the same manufacturer's opposing policy for *The Machine Shop* (November 1985 *Ahoy!*). The manufacturer does offer a $5 replacement after the 90 day warranty.

FS! Software, P.O. Box 635, Faribault, MN 55021 (phone: 507-332-8122). *—Morton Kevelson*

BILLBOARD MAKER
Solutions Unlimited, Inc.
Commodore 64
Disk; $39.95

There are 64,000 pixels in a C-64 high-resolution image (32,000 in a multicolor image). Within the limits of the C-64 graphic modes, each pixel

may appear in any of the 16 screen colors. Numerous graphic packages extend the user's control to each and every pixel on the display screen. Samples of the resulting works are published regularly in our *Art Gallery* (see pages 32-33 for this month's offerings).

Although 320 by 200 dots may seem like a lot, the experienced graphic artist soon discovers the limitations of the C-64's bit-mapped screen. While anguished cries are rarely heard, plaintive requests for more are all too common. *Billboard Maker* offers one possible solution to the pixel bottleneck. By the careful manipulation of the eight kilobyte bit map, four or sixteen times as many points can be combined into an integrated image.

Billboard Maker's modus operandi is deceptively simple. A C-64 bitmap image, in any of several popular formats, is loaded into the computer. Each of these 8000 bytes is then doubled in the horizontal and vertical direction. The resulting four times blowup is saved as four discrete files in any of the supported formats. If a linear doubling is not sufficient, quadrupling of each byte, in both directions, generates a 16 times enlargement. The resulting 16 image files will fill an entire disk. For this basic expansion the accompanying color information is considered as well.

Several options are available during and after the expansion process. If the original image is in the high resolution format, such as those produced by *DOODLE!* or *Flexidraw*, the *Billboard Maker* "optimizer" or smoothing option may be applied. This process averages adjacent pixels to reduce the blocky look or "jaggies" which result from the expanded size of each pixel. This option is not available for multicolor images such as those produced by the *Koala* package. The smoothing process does not consider color information in its algorithm.

For those with the time and patience, the expanded files may be individually loaded into the original graphic package. Once in this graphic environment, extensive detailing may be done. The finished product can have 4 or 16 times the detail of the original. Of course, no more than a fraction of this image can be displayed at one time. Here is where the *Billboard* part of the package comes into play.

Billboard Maker includes its own custom printer routines for sequential dumping of the linked images. A 16 times blowup is automatically printed as four rows of four images each. Tractor feed paper is a must for this while roll feed paper is even better. Some cut and paste is required to merge the four strips into an integrated whole. The result of this operation on Wayne Schmidt's Middle Earth (which is included with every *DOODLE!* disk) is a two by four foot poster when printed on a Gemini 10X.

Once started, the printing operation is fully automatic, with *Billboard Maker* fetching each file from the disk. However, it may be advisable to periodically pause the printing to allow the printhead to cool off. Two print utilities are included with the package. The one which is integrated into the program placed small gaps between each image on a row. The separate printer utility was apparently included to clear up this problem.

The printer dump is purely a bit map. No consideration is given to color. If you have a gray scale printer dump (such as *HardCopy* reviewed above), it may be used to individually print the image segments. A bit more cut and paste will be required for the finished product. The separate *Billboard Maker* print utility will do a color dump on the Canon PJ-1080A Inkjet Color printer.

We give *Billboard Maker* high marks in this regard. Three levels of color-coordinated menus control the package's operation. Although there was some redundancy in the menus, the setup and selection was fast and smooth. The accompanying manual was somewhat wordy and a bit tedious to wade through. Fortunately, once you have gone through the operation once, you will probably never look at the manual again. The onscreen prompts are that good.

Billboard Maker supports the precise positioning of text on the graphic screen. Five fonts are included with the package. Additional font disks are planned for the future. Text may be laid down in solid, shadow, or hollow modes. A graphic border or frame may also be added to the screen image. Four frames are included and additional frame disks are in the works.

Printers Supported by *Billboard Maker*

Okidata
Star Micronics
Epson
Panasonic
Commodore 1525
Canon Color Inkjet

Supported Graphic Packages

Animation Station
Blazing Paddles
Computereyes
DOODLE!
Flexidraw
Koala
Print Shop (Screen Magic)
Supersketch
Billboard Maker (its own format)

Once an image is loaded into *Billboard Maker*, several operations are possible. All images may be flipped top to bottom or left to right. High resolution images may be stripped of color and reversed or negatived.

The program is disk-oriented and includes full access to the disk drive command channel. The smoothing operation, which only works on high-resolution images, is time consuming. A 16 times blowup with smoothing takes about one hour to complete. Fortunately, the operation is fully automatic once it is started. Image segments are automatically saved to disk as they are done. The smoothing operation is continuously displayed as it takes place. Since the changes are sometimes quite subtle, the border color flashes to let you know that the program is working.

Once an image is loaded in it may be resaved using any of the supported image formats. Thus interpackage conversion is possible. However, the transfer from multicolor to high-resolution modes or vice versa is not likely to yield satisfactory results, as no consideration is given to the color data.

Billboard Maker does what it claims to do. What's more, it does it well. The package will probably fulfill the needs of many a C-64 graphic artist. Our only reservation for this product is the lack of gray scale color conversion in the printouts.

Solutions Unlimited, P.O. Box 177, Dobbs Ferry, NY 10522-0177 (phone: 914-683-5158). *—Morton Kevelson*

SCREEN DUMP, ETC.
IRQ, Inc.
Commodore 64
Disk; $24.95

Screen Dump, Etc. is a name that does not really give you the full picture. The Etc. part is, for me, far and away the value of this $25 program.

Screen dump utilities, which send a replica of the image on the screen to your printer, are nothing new. This one is pretty sophisticated; it will copy any screen image exactly. That includes low-res, hi-res, custom characters, sprites, and even split screens. To accomplish this, *Screen Dump, Etc.* kicks your printer into graphics mode, then reproduces the screen image dot for dot.

Average screen dumps take from 30 to 90 seconds (on my 100 cps Epson). That's for a nearly three inch square printed image. You can choose a double size image and the printing time can run over four minutes. Sprites are a big factor in slowing the process.

To print your screens with *Screen Dump, Etc.* you must have a disk drive, a printer with dot addressable graphics that prints 7 or 8 vertical dots at a time, and a printer interface with a transparent mode.

Most common printers are listed in the program's installation routine. For uncommon printers you will have to supply a variety of data like the number of wires in the printhead, graphics on and off codes, and commands to modify line feed. IRQ offers to help with custom installations, but only by mail.

Besides screen dumps, this program combines several important utilities–the *Etc.* part of the name. All of the program is RAM resident. It loads into your C-64's memory and waits while you load and run other programs. Then at the touch of a key, *Screen Dump, Etc.* halts the other program and takes control.

The extra utilities let you display and change BASIC memory allocation and screen memory allocation. They let you save any screen to a disk file and load it back into memory. They convert between decimal and hex literally on the fly. And they let you add your own machine language utility to this memory resident package.

For BASIC memory allocation, *Screen Dump, Etc.* will display the beginning addresses of BASIC text, variables, arrays, and strings, as well as the top of BASIC and the ending address of arrays. All displays are in both decimal and hex. By simply typing a new number, you are able to change any of these addresses.

You can actually monitor the amount of memory required at any point by a running program. Or after changing the addresses for the start of BASIC and the start of variables, you can save any portion of memory, even high memory that BASIC can not usually access.

For screen memory allocation, *Screen Dump, Etc.* displays the addresses of the low-res screen, hi-res screen, custom character set, and each sprite. Again, any address is easily changed.

When you save a screen to disk the program saves all characteristics of memory configuration that relate to the screen. These include low-res and hi-res screens, sprite data pointers and blocks, color RAM, custom character sets, and other special memory locations.

If you later load that screen you saved, you will get an exact replica, even though the program that produced the screen is not loaded. You will have the option to relocate any of the screen information, like sprite data, to nearly any portion of memory.

Conversion between decimal and hex is accomplished by positioning the cursor anywhere on a number and hitting a function key. The decimal or hex equivalent instantly replaces the number. Budding programmers will finally be able to remove that conversion chart taped to the wall.

Last, *Screen Dump, Etc.* is designed for you to append any machine language program or routine. If you wish, that program can be memory resident and a key press away. IRQ suggests that programmers will want to have a monitor program at their fingertips. Then they can explore and modify memory locations and access other machine language programs.

How compatible is *Screen Dump, Etc.* with other software, especially since it must coreside in memory and run at the same time? IRQ has recognized the problem of trying to be compatible with other programs that can usurp a wide variety of memory locations for their very own.

Screen Dump, Etc. can be installed in three different parts of the C-64's memory. The high version is where machine language programs usually reside. It leaves all 38911 BASIC bytes untouched and so will work with pure BASIC programs.

The low version is near the beginning of memory normally used by BASIC. It resets the pointer for the beginning of BASIC at the end of the *Screen Dump, Etc.* program, leaving 26623 bytes available. This version is more likely to work with machine language programs. The middle version leaves available the memory used by program cartridges, but leaves only 16255 bytes for disk-based programs.

You will probably have to experiment to find the version, if any, that will work with any commercial software. Even with these options, there may be too many conflicts for both programs to operate simultaneously.

If you just want to document your progress through a favorite game, you should check compatibility before you buy. But if you program at all, you'll soon find *Screen Dump, Etc.* to be the first disk you reach for as you power up.

IRQ, Inc., P.O. Box 457, St. Charles, MO 63302. –***Richard Herring***

TIPS AHOY!

Compiled by Michael R. Davila

Contributors to *Tips Ahoy!* receive up to $50—and in some cases more—for hints, short routines, and suggestions that help their fellow *Ahoy!* readers get more out of their Commodore computers (or get the same old things out more easily). Send your original flashes of brilliance to *Tips Ahoy!*, c/o *Ahoy!* Magazine, Ion International Inc., 45 West 34th Street—Suite 407, New York, NY 10001. Programs should be sent on disk; a stamped and self-addressed envelope must be included.

CUSTOMIZED OPERATING SYSTEM

The highly versatile MOS 6510 microprocessor in the C-64 enables the user to modify the operating system to suit the task at hand. During the existence of the C-64, three different Kernals have been created. Kernal Version 1, the original, was supplied with C-64's manufactured before mid-1983. Modifications were made, resulting in Kernal Version 2. The present version, Kernal Version 3, has been supplied since 1984. The ability to choose a Kernal version by making a software modification is crucial for universal software application. Programs written in different Kernal version eras capitalize on special features of the then-contemporary Kernal version. Undesirable program behavior occurs when certain software created in one era is run on a C-64 manufactured in a different era. Here is a short routine which demonstrates how the C-64's operating system can be modified to suit one's needs. For example, early demo programs produced by Commodore demonstrated the music capabilities of the 64. However, many people never see the scrolling notes as the music plays. This is due to the fact that since these routines were written in ML for the earliest Kernal version, they use the store instruction to directly update screen memory without updating color memory with a contrasting color. Hence the scrolling notes are invisible. This routine solves the problem.

```
10 REM CONVERT TO VERSION 1 ROM MODE
15 REM COPY BASIC INTERPRETER FROM ROM T
O RAM
20 FOR J=40960 TO 49151
25 POKE J,PEEK(J)
30 NEXT J
40 REM COPY KERNAL FROM ROM TO RAM
50 FOR I=57344 TO 65535
55 POKE I,PEEK(I)
```

```
60 NEXT I
65 REM CHANGE BANK SELECTOR SWITCH
70 POKE 1,PEEK(1)AND253
75 REM MODIFY CLEAR SCREEN INSTRUCTION T
O LOAD $001 INTO COLOR MEMORY
80 POKE 58586,169:POKE58587,1:POKE58588,
234
90 PRINT"BACKGROUND COLOR NOW LIKE VERSI
ON 1 ROM"
95 END
```

–Michael E. Kress
Paul Maioriello
Staten Island, NY

PARTIAL SCREEN CLEAR FOR THE C-64

One nice feature of the C-128 is the ability to clear the screen from the current cursor position to the end (ESC @). This is such a useful feature that I decided to write a program that would add a similar feature to the 64. The program is an interrupt driven routine that will clear the screen lines from the current through to the last when the English Pound sign is pressed. The routine resides in memory from 679 to 760 and is activated by entering SYS 679. RUN/STOP RESTORE or SYS 760 will kill the routine. You are able to change the response key to another by changing the 48 in line 210 to the keyboard matrix value (not ASCII) of your choice (e.g., @ = 46, left arrow = 57). Location 197 holds the value of the last key pressed, and location 203 holds the value of the current key. The routine will protect itself from being reengaged if it is already alive, so multiple SYS 679's will do no harm. It also protects itself from multiple kills as long as the original IRQ vector is the default system vector ($EA31).

```
IFPEEK(197)=48THENFORI=PEEK(214)TO24:POK
E781,I:SYS59903:NEXT
```

–James C. Dunavant
Gainesville, FL

```
100 FORI=679TO760:READA:C=C+A:POKEI,A:NE
XT
110 IFC<>10783THENPRINT"ERROR IN DATA ST
ATEMENTS":END
120 PRINTCHR$(147)CHR$(17)"PSC INSTALLED
"
130 PRINTCHR$(17)"SYS679 TO ENGAGE"
140 PRINTCHR$(17)"PRESS '+' TO PCLEAR"
150 PRINTCHR$(17)"SYS706 TO KILL"
160 DATA 173,20,3,174,21,3,224,2,240,16,
133,251,134,252,120,169,211,162,2,141
170 DATA 20,3,142,21,3,88,96,120,165,251
,166,252,224,234,208,7,141,20,3,142,21
180 DATA 3,88,96,165,197,201,48,240,3,10
8,251,0,165,157,240,249,166,214,32,255
190 DATA233,232,224,25,208,248,169,1,133
```

```
,204,160,0,166,214,24,32,240
200 DATA255,108,251,0
```

AUTOGRAPHED 128's

The designers of the C-128 did not want to go totally unrecognized for their work. It seems that they left their signatures in the machine. Type this line in and RUN it to reveal who they are. —Michael R. Davila

```
10 FORI=25589TO25610:PRINTCHR$(PEEK(I));
:NEXT
```

THY CREATOR

Here is a short program which will create program lines in advance or delete lines. Creating lines in advance is especially useful when entering a lot of data statements, such as copying a program from a magazine. It spares the bother of typing in each line number and the word "DATA". This method obviates many typing errors.

To create lines, just RUN the program and follow the prompts. Enter the first line number, last line number, increment (defaults to 1 if no number is entered) and any valid command (DATA,PRINT,POKE,PEEK...) which will not affect your program's operation. Deleting lines is done the same way as creating lines, except no entry is made to the command prompt. To make the program self-delete, enter RUN 63000 and press RETURN five times in response to the prompts.

To append this program to an existing program enter in direct mode

```
63000 F=63000:L=63000:I=1:INPUT"<CLR><DW
N><DWN><DWN><DWN><DWN>FIRST LINE # ";F:F
F=F
63001 INPUT"<DWN>LAST LINE #  ";L:INPUT"
<DWN>INCREMENT";I:INPUT"<DWN>LINE INSTRU
CTION ";L$
63002 PRINT"<DWN><DWN><DWN><DWN>PRESS RE
TURN TO EXECUTE;":PRINT"<DWN>PRESS 'Q' T
O QUIT;<DWN>"
63003 PRINT"ANY OTHER KEY TO RESTART":WA
IT198,1:POKE198,0:IF PEEK(197)=62 THEN E
ND
63004 IF PEEK(197) <> 1 THEN RUN 63000
63005 Q$=CHR$(34):PRINT"<CLR><DWN>":FORX
=1TO13:PRINTF;L$:F=F+I:IFF>LTHENX=13
63006 NEXT X: IF F>L THEN 63008
63007 PRINT"F="F":I="I":L="L":FF="FF":L$
="Q$;L$;Q$":GOTO63005":GOTO63009
63008 PRINT"POKE198,0:PRINTCHR$(147);:LI
ST";FF;"-";FF+11*I
63009 POKE214,0:FORKB=631TO644:POKEKB,13
:NEXTKB:POKE198,14
```

At this point load in the program that you wish to append. After the program has finished loading enter POKE 43,1: POKE 44,8 and hit RETURN. —Rod MacDonald
Seattle, WA

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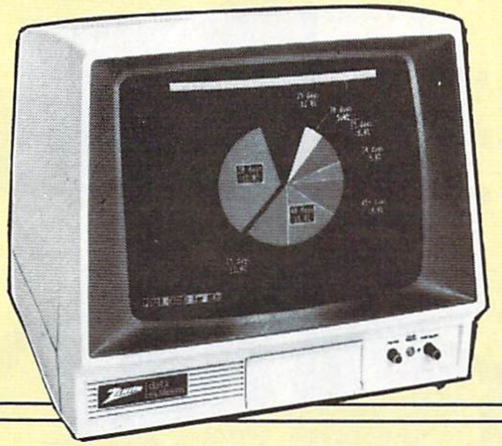
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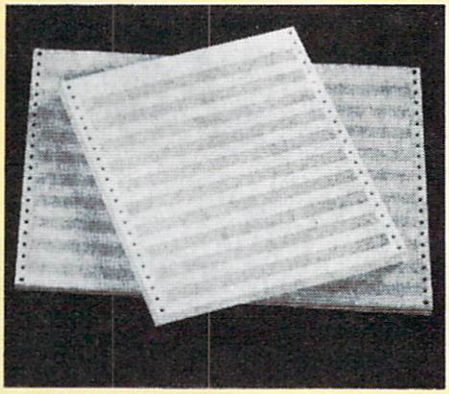
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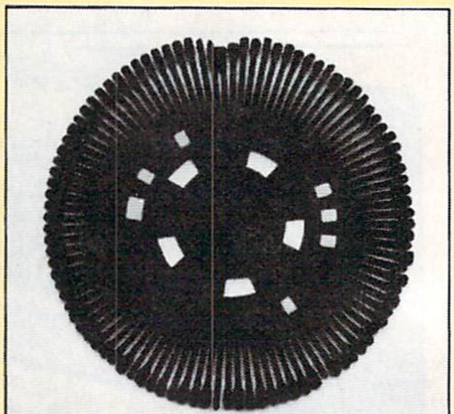
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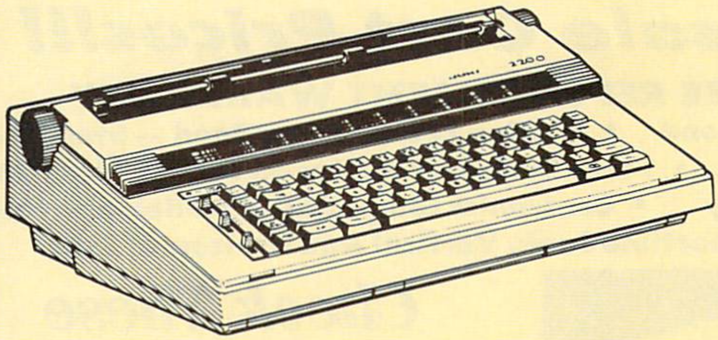
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- Drop in cassette ribbon — express lift off correction or eraser up to 46 characters!
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15 Day Free Trial — 90 Day Immediate Replacement Warranty

Extra Daisy Wheels for Olympia Printers.

Herald Pica (PICA)
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Carroll Pica (COURIER)

$18.95 EACH

Primus 10 (ORATOR)
Helen 12 (SCRIPT)
Mini Majestic (MICRON)

COM-64 — VIC-20 INTERFACE	$39.95
ATARI INTERFACE	$59.00
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Good quality 5¼" single sided double density with hub rings.

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CADILLAC QUALITY (Double Sided, Double Density) ***Specifically designed for use with C-128***

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For those who want cadillac quality we have the C-128 Floppy Disk. Used by professionals because they can rely on C-128 Disks to store important data and programs without fear of loss! Each C-128 disk is 100% certified (an exclusive process) plus each disk carries an exclusive FREE REPLACEMENT LIFETIME WARRANTY. With C-128 disks you can have the peace of mind without the frustration of program loss after hours spent in program development.

100% CERTIFICATION TEST

Some floppy disk manufactures only sample test on a batch basis the disks they sell, and then claim they are certified. Each C-128 disk is individually checked so you will never experience data or program loss during your lifetime!

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We are so sure of C-128 Disks that we give you a free replacement warranty against failure to perform due to faulty materials or workmanship for as long as you own your C-128 disk.

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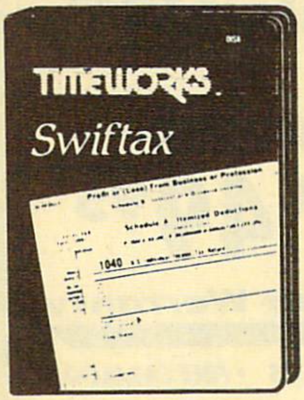
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C-128 Disks are definitely the Cadillac disk in the world

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All disks come with hub rings and sleeves in an attractive package.



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This program includes:

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- Full prompting — you will be guided through the tax preparation process by thoughtful, easily-understood instructions (prompts) from your computer display screen.
- Password protection — To prevent unauthorized access to your confidential data.
- A Special Backup Feature — which quickly generates extra backup copies of your recorded information to guard against the loss of important data.

List $49.00 **Sale $29.95**

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Commodore 64

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Keyboard Replacement — Voice Recognition

The Voice Command Module is a speech recognition device that lets you give commands to your Commodore-64 with your voice instead of a keyboard. This unit converts the sound waves generated when you talk into digital data that is stored in the computer memory. When you speak to your computer, the words you speak are matched against the data stored in memory and the result is converted to an instruction for the computer to perform. This is perfect for programmers and first time users alike. Six programs are included to help you get acquainted with the world of speech recognition.



SOS — Speech Operating System — This is the general utility program which helps you to build a speech file made up of a set of words.

Card File Program — This is a data base much like an index card file which you can control with your voice. You can store recipes, addresses, phone numbers or any kind of information you need to have filed. Up to 100 files may be kept on a single disk.

Aeronaut Game — This game challenges you to land a hot air balloon on 5 different landing pads without crashing into anything or running out of fuel. The balloons altitude is controlled by your voice which adds or removes hot air from the balloon.

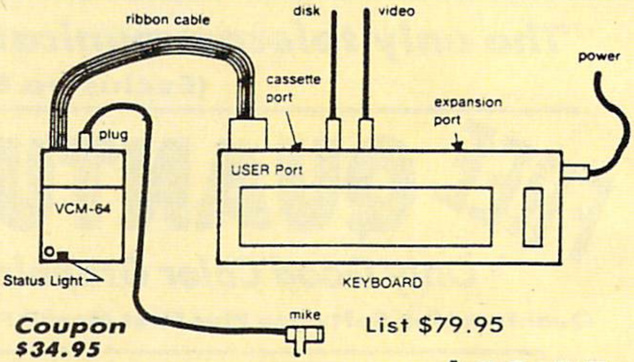
Word Mix Puzzle — Here you must match words much like Concentration. If you guess correctly you win. No hands on the keyboard are needed since the speech recognition unit does the keyboard work from your voice.

Speech Graphics — Demonstrates how the voice command module works. Here you can graphically see what your speech looks like on the screen.

Demo Program — This is a simpler version of the Aeronaut game that shows you how a simple program is made when listed.

PLUS: You get easy to use instructions for making your own programs in BASIC or machine language using the voice command module.

All Six Programs Included FREE



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MAKE YOUR COMPUTER TALK

List $89.00

$39.95 SALE

VOICE SYNTHESIZER — You can program any words or sentences • Adjust volume and pitch • Receive Modem messages • Make adventure games that talk • Real sound action games • Make customized talkies • Plugs into cartridge port. Plus **FREE** Text to Speech Software. (See Below) List $89.00. **Sale $39.95.**

FREE $19.95 Software w/ Synthesizer Purchase.

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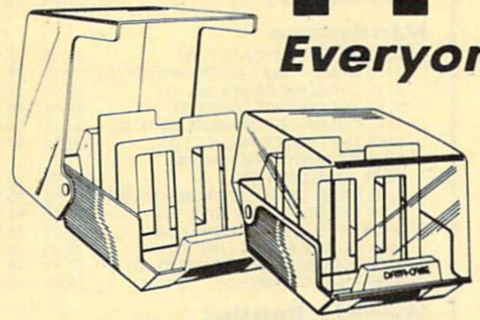
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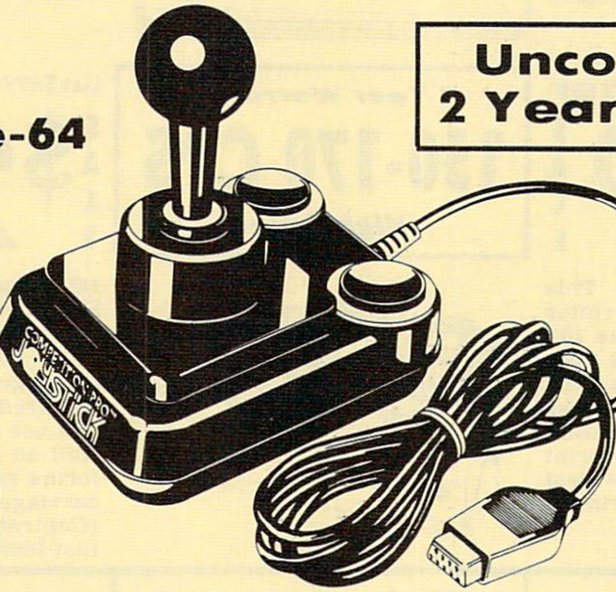
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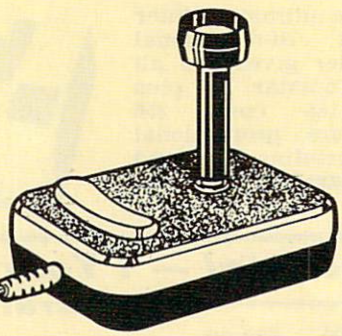
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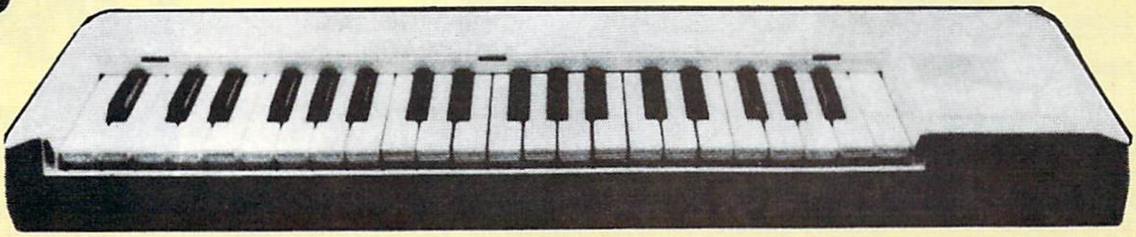
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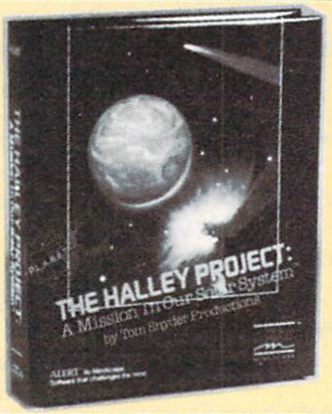


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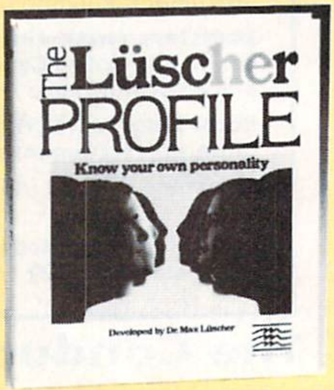


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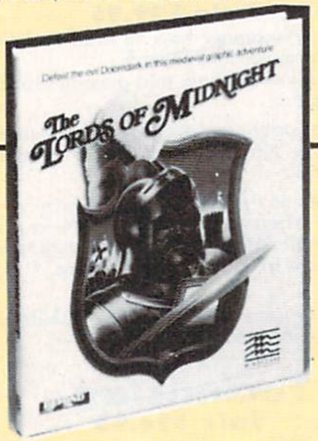
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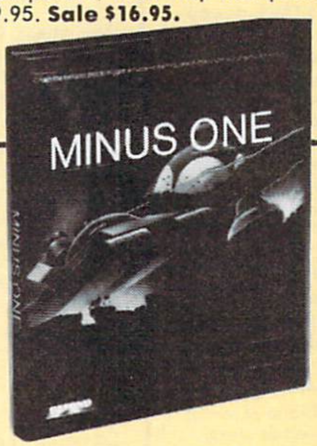


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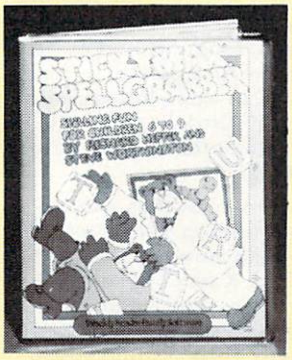
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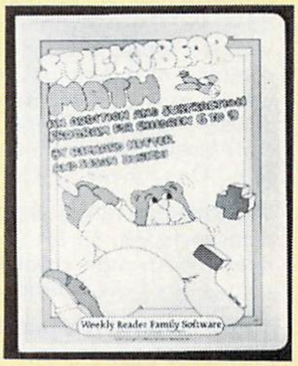
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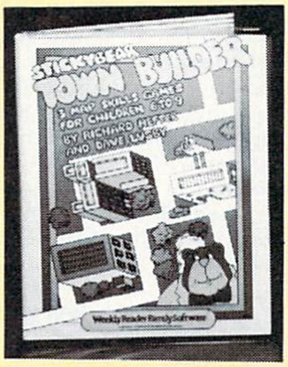
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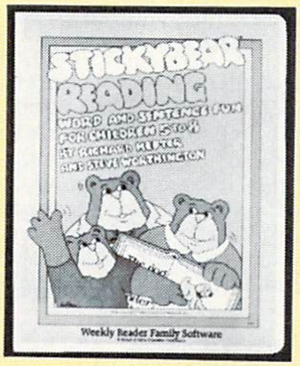


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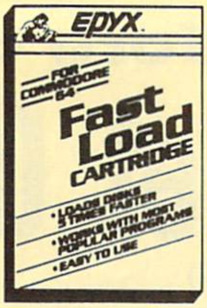
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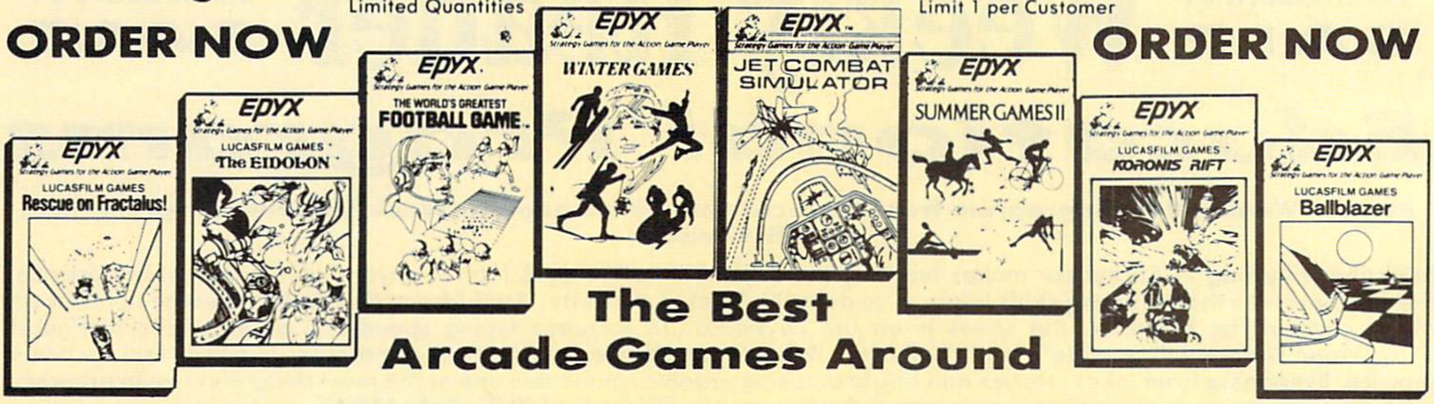
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COMMODORE ROOTS

MAKING HEADLINES–THE EASY WAY

By Mark Andrews

Sometimes laziness is the mother of invention in computer programming. The program we'll examine in this column, and another that will be presented next month, will demonstrate how true that statement can be. When I created this pair of programs, I was designing a title screen for a computer game, and needed a routine that would display the name of the game in big, flashy characters. But I didn't have a headline-size character set at my disposal, and I had no desire to design a complete set of giant-size characters from scratch. So I sat down, started thinking, and eventually asked myself a question that contained my answer: Why not just copy my Commodore's built-in character set from ROM to RAM, and then blow it up to several times its normal size?

With that thought in mind, I turned on my Commodore, booted up my *Merlin* machine language assembler, and went to work. The results of my efforts were the two programs that we'll look at here and next month. This month's program, BIGCHRS, can be roughly divided into two parts. Part 1 (Lines 1 to 367) copies the C-64's built-in character set from ROM into RAM, using a number of routines discussed in previous columns. Part 2 (Lines 368 to 471) uses some new techniques, along with some old ones, to print a character on the screen.

Even the so-called new techniques may not look completely new to *Commodore Roots* readers. BIGCHRS, just like the screen-printing program presented last month, is designed to display a character on the screen by copying it dot by dot from a block of data stored in memory. But unlike last month's program, BIGCHRS copies each dot *twice*–and then, each time a row of dots has been copied, copies a second row just beneath it on the screen.

The result of this operation is a character four times the size of a normal C-64 text character–twice as wide because each dot has been copied twice, and twice as deep because two rows of dots have been copied onto the screen for every single row stored in memory. Study the nested loops at the end of BIGCHRS carefully, and you'll see how easy it is to transform ordinary text characters into giant-size text characters on a C-64 screen. The task is so straightforward, in fact, that there's not much more to say about it. So now we'll move on to another topic–how to mix headline-size characters and sprites on a Commodore 64/128 screen.

Programming sprites is also a fairly uncomplicated task–once you know how to program in assembly language. In fact, according to most of the expert C-64 programmers I know, it's much easier to program sprites using assembly language than with BASIC. That's because sprites are considerably easier to work with using binary and hexadecimal calculations than with decimal numbers.

WHAT'S IN A SPRITE

Sprites, as every *Ahoy!* reader knows by now, are graphics characters that can be created, colored, and animated fairly easily, and moved around on command, completely independent of other kinds of characters displayed onscreen. Using ordinary programming techniques, up to eight sprites can be displayed on a C-64 screen simultaneously. By convention, these eight sprites are numbered 0-7.

Sprites are made of tiny dots, just like programmable text characters; and like programmable characters can be created using standard bit-mapping techniques. But sprites are larger than text characters: a sprite can measure up to 24 horizontal screen dots wide and up to 21 vertical screen dots high.

A sprite can be displayed in any of the 16 colors available to the VIC-II chip. It is also possible to create multicolored sprites. Space does not permit me to provide instructions for programming multicolored sprites in this column, but much additional information can be found in my book *Commodore 64/128 Assembly Language Programming* (Sams, 1985), as well as in the *Commodore 64 Programmer's Reference Guide.*

Sprites, like text characters, can be expanded to twice their normal width and twice their normal height, or four times their standard size. The sprite used in this column will be an expanded one.

As stated, a sprite can measure up to 24 dots (or bits) wide, and up to 21 dots (or bits) high, for a total of 504 dots, as pictured in Figure 1.

A sprite bit can also be pictured as a *byte* map–a ma-

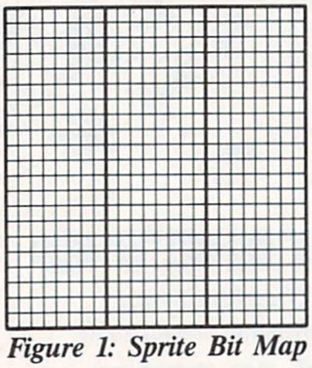


Figure 1: Sprite Bit Map

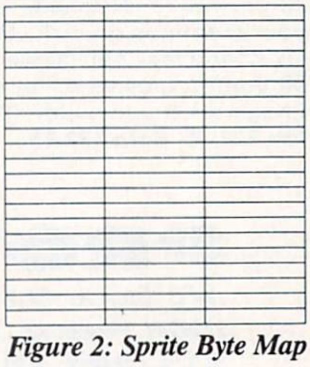


Figure 2: Sprite Byte Map

trix that measures three bytes wide by 21 bytes high, for a total of 63 bytes. Actually, the bytes that make up a sprite are in consecutive order in RAM, starting with the byte in the upper left hand corner and ending with the 63rd byte, the one in the lower right hand corner. But when a sprite appears on the screen, it looks more like Figure 2.

Although it takes only 63 bytes to form a sprite, each sprite consumes 64 bytes in RAM. The 64th byte of each sprite map is used to mark the end of its location in memory.

Sprites can be placed anywhere in free RAM, and a pointer is provided to mark the location for each sprite. Each sprite pointer is one byte long, so it takes eight bytes of RAM to hold the eight pointers needed to address the C-64's eight sprites. These eight pointers are always the last eight bytes of whatever block of RAM has been designated as screen memory. When the location of screen memory is moved, the addresses of the C-64's eight sprite pointers also change. But it's easy to find them, since they always take up the last eight bytes of whatever block of RAM is being used as screen memory.

A one-byte value is all that's ever needed to define the starting address of a sprite map, since sprites always fall into whatever 16K bank of memory is currently accessible to the VIC-II chip. That means that a sprite pointer is actually an *offset* that must be added to the starting address of the graphics bank currently in use to determine the starting address of the bit map that is to be used to form the sprite.

When the 64 is first turned on, its VIC-II chip is set to retrieve graphics information from bank 0 and to get its screen map from memory registers $0400 through $0800 (1024 through 2048 in decimal notation). At power-up time, therefore, the default address of the first sprite pointer, or sprite pointer 0, is $07FB (or 1020 in decimal notation). And the next eight bytes in RAM are the pointers for sprites 1 through 7. So the default addresses of the pointers for the 64's eight sprite pointers are memory addresses $07FB through $07FF–the last eight bytes in the block of RAM designated as screen memory.

To find the data that it needs to display a sprite, then, all the Commodore 64 has to do is look at the 8-bit value stored in the appropriate sprite pointer. When that value is added to the address of the graphics bank currently in use, the result will be the address of the bit map that must be used to define the sprite.

Before a sprite can be displayed, it must be turned on. Sprites are turned on and off with a *sprite enable register* (abbreviated SPENA) situated at memory address $D015. Each bit of the SPENA register is associated with one sprite; bit 0 is used to turn sprite 0 on and off, bit 1 is used to control sprite 1, and so on. If the bit associated with a sprite is set, the sprite is enabled. If the bit is not set, the sprite is not enabled and cannot be used.

POSITIONING SPRITES ON A SCREEN

Each of the C-64's eight sprites has two position registers: an X position register used to determine its horizontal placement on the screen, and a Y position register used to determine its vertical position. These registers are abbreviated SP0X through SP7X and SP0Y through SP7Y. In addition, there is a *most significant X position register* (abbreviated MSIGX) used to designate the horizontal positions of all eight sprites. This register is needed because a sprite can be placed in 512 possible horizontal screen positions–too many positions for an eight-bit register to keep track of. If a sprite is to be placed in a position that can be stored as a value in an 8-bit register–that is, in a position with a value of less than 255–the MSIGX register is not used. But if the horizontal position of a sprite has a value of more than 255, a bit in the MSIGX register is set. Each bit of the MSIGX register equates to the number of a sprite; bit 0 is used for sprite 0, bit 1 for sprite 1, and so on.

There is no MSIGY register because there is no need for one. A sprite can be placed in only 256 vertical positions, so only one 8-bit register per sprite is needed to handle the vertical positioning of sprites on the C-64's screen.

When you store values in a horizontal or vertical position sprite register, that value is used to determine the position of the *upper left hand corner* of the sprite. But storing a value in a horizontal or vertical position register does not ensure that a sprite will be displayed on the

screen. Of the 512 possible horizontal positions of a sprite, only positions 24 through 343 are visible on the screen. Of the 255 vertical positions available, only 50 through 249 are actually visible on the screen. It's therefore quite easy to make a sprite disappear; all you have to do is store the value of an offscreen position in its horizontal or vertical position register.

Here are the locations of all of the sprite position registers used by the Commodore 64:

SPRITE POSITION REGISTERS

Hex Address	Position Register	Hex Address	Position Register
D000	SP0X	D008	SP4X
D001	SP0Y	D009	SP4Y
D002	SP1X	D00A	SP5X
D003	SP1Y	D00B	SP5Y
D004	SP2X	D00C	SP6X
D005	SP2Y	D00D	SP6Y
D006	SP3X	D00E	SP7X
D007	SP3Y	D00F	SP7Y

D010–MSIGX (Most Significant X Position Register)

SELECTING COLORS FOR SPRITES

In addition to its two 1/8 position registers, each sprite also has a color register. The color register for sprite 0 is at memory address $D027, and the addresses of the color registers for the other seven sprites follow in consecutive order. The color address for sprite 7 is therefore at memory address $D02E.

To select the color of a sprite, all you have to do is store the standard value of one of the Commodore 64's 16 colors in that sprite's color register. Every bit that is set on the sprite's bit map will then be displayed in the selected color. Every dot that has a value of 0 will be transparent, and will not cover up anything beneath it on the screen.

EXPANDING SPRITES

By using two registers called XXPAND and YXPAND, a sprite can be expanded to twice its normal width, twice its normal height, or both. The XXPAND register is at memory address $D01D, and the YXPAND register is at $D017. Each bit in each register corresponds to a sprite number, with bit 0 controlling the size of sprite 0, bit 1 controlling the size of sprite 1, and so on.

Next month we'll take a closeup look at a sprite that has been programmed in assembly language using the techniques outlined in this column. The sprite, shaped like a heart, will be out of viewing range when the program begins. But it will slowly descend into view, parachuting down until it becomes part of a message displayed in the center of the screen.

After we have programmed and watched this descent of a sprite, we'll start exploring another fascinating topic for assembly language programmers: the music and sound capabilities of the Commodore 64. ☐

SEE PROGRAM LISTING ON PAGE 110

SCUTTLEBUTT

Continued from page 14

same name, the *Quick Brown Box* cartridge plugs into the expansion port of the C-64 or C-128, allowing the user to write or load up to 8K of BASIC or machine language programs that will be immediately available upon power-up. Included are a write protect switch and reset button, as well as auto-start, BASIC utilities, and ML monitor. Price is $39.00 plus $3.00 shipping.

Brown Boxes, Inc., 617-275-0090 (see address list, page 130).

PRINTER ENHANCER

Xetec's *Printer Enhancer* for parallel printers features a buffer expandable in 8K or 32K increments for a total memory of 64K or 256K respectively, selectable fonts (eight included; others available on request), intelligent printer switch for operation of one or two printers with independent selection of fonts and data, a full front control panel including controls for clear (clear buffer data), copy (print copies of buffer data), pause, printer selection, and font. Internal diagnostics include a test for the buffer RAM, front panel switches, and LED's, plus helps for printer setups.

Xetec, Inc., 913-827-0685 (see address list, page 130).

COLOR INKJET PRINTER

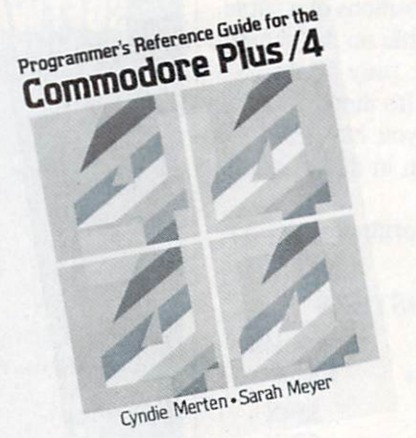
The Canon PJ-1080A Inkjet Color Printer produces impressive graphics at the rate of three minutes per dump (six minutes for double density). Included is a three-color ink pack rated at over three million characters, or about 7200 single density images. Price will be about $500, which includes printer, screen dump software, and an improved version of *Peripheral Vision* (the light pen-driven graphics package from the now-defunct Futurehouse).

Progressive Peripherals and Software, 303-825-4144 (see address list, page 130).

64 MODE ENHANCER

Matrix will allow you to access most of the C-128's outstanding features while in C-64 mode, including the numeric keypad, the extra top row keys, built-in 80-column RGB display, and the FAST mode running at a 2 MHz clock speed. *Matrix* also includes a built-in fast loader for C-64 mode, built-in DOS utility menu, and a high speed disk copy utility for the 1571 disk drive. This routine uses special data compaction techniques which in most cases allow for the storage of an entire double-sided 1571 disk in the C-128's RAM, permitting a full disk copy in a single pass in under three minutes.

Progressive Peripherals and Software, 303-825-4144 (see address list, page 130).



Covers operating system, 6502, more.
READER SERVICE NO. 149

LEARNING PROGRAMS

Three of the 20 Learning Technologies titles preannounced in December's *Scuttlebutt* have come available, each priced at $19.95:

Math in a Nutshell provides practice in problem solving for students in grades 4-8. The program is broken into three difficulty levels, each of which presents equations in a horizontal format and requires the student to insert the appropriate signs.

Bike Hike provides preschoolers through third graders with exercise in specific recall, visual memory, one-to-one relationships, counting, number recognition, and visual discrimination.

Pipeline lets second through sixth graders practice visualizing the whole, analyzing problems, and planning and experimenting with solutions.

Learning Technologies, 214-991-4958 (see address list, page 130).

PLUS/4 GUIDE

Face it, owners of that little charcoal gray computer–the Plus/4 has peaked. But you haven't been totally abandoned. Scott, Foresman's *Programmer's Reference Guide for the Plus/4* ($21.95) reviews programming techniques (including each BASIC 3.5 command), the machine language monitor, 6502 assembly language, and the operating system, with information not found in the Plus/4 manual. Additionally, the appendices provides the Plus/4 memory and register maps and other technical specifications.

Scott, Foresman and Company, 312-729-3000 (see address list, page 130).

UPGRADED MANAGER

The latest version of *Grade Manager III* allows C-128 owners to use their computer's additional features (separate cursor keys and numeric keypad) in C-64 mode. Among the other improvements are the option to include graphs and progress evaluation checklists in reports and to prepare worksheets listing students by room or by hour.

Smoky Mountain Software, 704-885-2516 (see address list, page 130).

KMMM USER NOTES

Wilserv Industries is living up to its name by publishing periodic User Notes for owners of its KMMM Pascal program. The latest edition, consisting of three typewritten pages, covers a range of topics of certain interest to devoted users. To receive the next issue, send a self-addressed, stamped envelope to Wilserv Industries (see address list, page 130).

RECHARGED

Batteries Included has updated the following products:

The C-128 version of *PaperClip* ($59.95) now stores up to 999 lines

Continued on page 130

CADET'S COLUMN

TAX TIME AGAIN

Including *1040A Calculator* for the C-64, C-128, VIC 20, and Plus/4

By Cheryl Peterson

The month of April brings joyous thoughts of getting even with the government once again. That is, we all sit down and try to figure out how much of our money we should have given to the government in the last year. If we're lucky, we find that we've given Uncle Sam more than he deserves and send him a 1040 that says he owes us money. If not, we sit down with our checkbook and make up the difference.

For folks like me, who must keep track of two businesses and a husband's full-time job, April is a time of calculators, piles of forms, and a few reference works. But if you can get by with filling out the 1040A Short Form, this month's column includes (on page 113) a program that will let you do exactly that. It will work on a C-64, C-128, VIC 20, or Plus/4 (though the *Bug Repellent* line codes listed beside the program lines are for the 64 only).

In our continuing attempt to gently teach BASIC programming, we'll take a look at how the 1040A calculator works and answer a letter from a reader who asked for a modification to the *Compuloan* program we ran a few months ago.

For those whose taxes can't be done on the 1040A form, several software houses offer tax calculating programs (see list). The Lasser's tax package includes their tax guide as part of the documentation.

A SHORT PROGRAM FOR THE SHORT FORM

This month's program will take the figures that you fill in on the short form and deduce your refund or taxes due.

Several steps are involved in figuring your tax liability. You need to know how much taxable income you had for the year. Once that's figured, you can check to see how much in taxes you should have paid. You then must figure how much taxes you've already paid and subtract that from what you owe. Though this is simple math and can easily be done on a calculator, it is also a great opportunity to take a look at how math functions are handled in BASIC.

The program starts out by giving you an opportunity to request a listing of the information to put in each blank on the tax form. Another question asks (if appropriate) whether you want the information on the screen or the printer.

Before we can manipulate figures, we need to get them into the program. To do this we use lines 100-900 to input the values the program needs to make its computations. We use the variables:

W	Wages
I	Interest earned
D	Dividends earned
E	Excluded interest and dividends
U	Taxable unemployment compensation
P	Political contributions
F	Federal income tax withheld
C	Earned income credit

The GOSUB command in line 1100 sends execution down to our first equation. The IRS considers wages, interest, and dividends to be income, and all three are taxable. Certain types of interest and dividends aren't taxable, but the government still wants a full accounting of every dollar. You must declare the income and then subtract the excludable amount.

In line 2100 of our program, the variable Z is the total of the interest and dividends (Z=I+D). Most of us learned to write equations back in algebra class, and our

TAX PROGRAMS

Tax Aid ($39.95; yearly updates $13.50) **Northland Accounting** **606 2nd Ave.** **Two Harbours, MN 55616**	**Tax Aid ($33.00; $45 for professional version; $22 and $30 for upgrades)** **KSoft Co.** **845 Wellner Rd.** **Naperville, IL 60540**
Comtax ($34.95) **Milo Software** **P.O. Box 569** **Boston, MA 02130**	**Tax Command Professional ($45.95)** **P.O. Box 93104** **Milwaukee, WI 53203**
Income Tax Assistant ($49.95) **H & E Computronics, Inc.** **50 N. Pascack Road** **Spring Valley, NY 10977**	**J. K. Lasser Your Income Tax** **Simon and Schuster** **1230 Avenue of the Americas** **New York, NY 10020**
It's Tax Time ($45.00; yearly updates $10.00) **2797 Meridian Ave.** **Redwood City, CA 94061**	**Tax Master ($28.00)** **Master Software** **6 Hillery Ct.** **Randallstown, MD 21133**

teachers generally preferred to see the calculations on the left side of the equals sign. BASIC requires that the equations be written backwards from this. The variable which will hold the results must be stated before the equation that figures the calculation. So Z=I+D.

The second equation (Y=Z−E) uses the Z variable that we just computed. We need to subtract the excluded interest and dividend (variable E) from the total interest and dividends earned (Z). Because the government won't allow us to exclude more interest and dividend income that we've made, we use the IF/THEN statement to compare Y with zero. If it is less than zero, we reassign the value to be equal to zero.

Line 2200 computes the total income for the year (GI=W+Y+U). In this case, the gross income is equal to wages plus interest income plus taxable unemployment received.

Line 2300 demonstrates how to do a multiplication equation. Again, the variable to hold the result must come first (X2=1000*X). This calculates the deductions that go on line 11 of the tax form. Since you are given a $1000 standard deduction per exemption claimed, we must multiply 1000 times the exemptions entered for the X variable.

It is perfectly "legal" in BASIC to use the same variable before and after the equals sign. This equation could have been stated X=1000*X. However, I want to reuse the X variable later in the program when we create a printout of the numbers to fill in on the 1040A form. So I used a new variable, rather than lose the value stored in X.

This is a fairly important concept in BASIC programming. If you have figures in your program that need only be used once, you can reuse a variable to handle them all. In some programs you will see a variable used repeatedly for temporary input. In most of these programs, the input is then reassigned to a new variable or calculated for immediate use. Since I have such a small program and all my figures will be reused by the print statements at the end, I have assigned each value its own permanent variable.

Line 2400 (TN=GI−X2) computes taxable net income, or the gross income minus the exemption amount calculated in line 2300, and assigns this value to variable TN. This figure is used in line 1200 to let you know how much taxable income you need to look up in the tax tables.

Line 2500 (TP=P+F+C) calculates how much tax you've already paid (F) and how much credit (P and C) you have coming. The total of these figures is held by the variable TP (total paid) which is entered on line 14 of the 1040A.

The figure entered in program line 1200 fails to take into account advanced earned income credit which may have been claimed for the previous year, so this must be calculated into your total tax due. Line 2600 of the program takes care of this for us. And we're almost done!

Line 1500 clears the screen in preparation for the printout that may be coming up. Line 1560 checks whether a screen listing has been requested. If so the program jumps to the print routine just after the "Open the printer channel" statement. In this way we can still use the routine without actually creating a hard copy.

To really understand this line you must realize that IF/THEN statements are only executed if the exact conditions specified are true. In this case we are testing to see that Q2$ is not equal to "P" *and* that Q$ is not equal to "N". Both conditions must be true in order for the program to skip to line 1930. We are checking to see that the user has said "No, I don't want the printer turned on" and "Yes, I do want the listing for filling in the blanks."

Stop a moment and think of another, shorter way to achieve the same goal. There is one, and I'll tell you what it is at the end of the column.

If the screen listing has not been requested, the program continues to line 1570 which checks to see if a "hard copy" printout has been requested. If so, the program jumps down to line 1921. The printer channel is opened, the information is printed, and line 1997 checks to see whether we are creating a hard copy or not. If so, it assigns the value 1 to the variable CL and returns to line 1600.

The routine that starts at line 1600 is used to figure out whether you owe tax or have a refund coming by comparing the values in TP and TT. It prints the appropriate message to the screen.

Lines 1797, 1897, and 1917 check to see if the channel to the printer is open. If not, they jump to an end state-

ment. If the channel is open, the next line closes it.

The rest of the program (lines 1930-1990) just prints out the information that needs to be put into your 1040A.

I DO GET LETTERS!

Helen Eichman of Oregon wrote me recently about a problem she was having with the *Compuloan* program that accompanied my column several months ago.

Her letter reads:

Sirs:

I just finished keying in *Compuloan* from the Nov. '85 issue. I'm convinced there is an error in the math formula somewhere. I used the *Bug Repellent* program and it says I typed correctly.

Below is the starting of the program for a $90,000 loan for 25 years at 11.5%. Below that is one of the printouts of another similar program. You can see the results are not the same and in fact the *Compuloan* program adds the first month's interest to the principal and fails to subtract the payment. It goes on to figure the interest on the new loan amount and of course continues to be wrong.

Also included is a printout of the program from my disk. Is the program wrong or am I?

loan payment calculator
amount financed $ 90000.00
interest rate 11.5%
of payments per year 12
total number of payments is 300
each payment is 914.82
total interest paid is $ 184446.61
total amount paid is $ 274446.61

bal	payment	interest	principal
99862.50	914.82	862.50	52.32
90810.17	914.82	870.26	44.55
90765.62	914.82	869.83	44.98

The other program's information is

month	balance	interest
1.	89947.67	862.50
2.	89894.84	862.00
3.	89841.50	861.49
4.	89787.65	860.98

I'd appreciate any help because I like the printout better but need accuracy.

The printout of the program showed that she had entered the critical lines correctly. Gee, that *Bug Repellent* program does work.

I must be from the only state in the union that requires the first interest payment in advance. Unfortunately, I misunderstood the local real estate agent when he said that this interest payment could be added to the amount of the loan and be figured as part of the loan. So, as she points out, my calculations do come up different.

I think most of you will benefit from her letter, since the problem is easily solved and most of you would probably prefer that it ran her way. Merely delete line 687 from the program and it will work just as requested.

For those who haven't entered the program and would like a copy of it, it's available (the modified version, that is) on Viewtron in the newly activated download section. The download section is located on page 4000, or you can type the keywords C64 DOWNLOAD to get there. Named *Loan Calculator*, it is in the business programs section under accounting programs. It doesn't take very long to download.

After deleting line 687, I tried Helen's sample run. The initial figures are all the same. The payment schedule looked like this:

Balance	Payment	Interest	Principle
90000.00	914.82	862.50	52.32
89947.67	914.82	861.99	52.82
89894.85	914.82	861.49	53.32
89841.52	914.82	860.98	53.84

I want to thank those of you who have been corresponding with me through Viewtron. I want the column to be as useful to new users as possible. I'm always looking for ideas to use. I've received quite a few suggestions, but most of them don't fall into the beginning (or even intermediate) user category.

Look for me in the For Starters SIG of Viewtron. I will be available in our CB section on Saturday nights from 8 to 11 EST, hiding behind the handle Cherp!. Although I frequently spend my evenings in CB, this is my scheduled night to appear. Hope to see you there.

The answer to the earlier puzzle is IF Q2$="S" GOSUB 1930. ☐ *SEE PROGRAM LISTING ON PAGE 113*

COMMODARES

By Dale Rupert

Each month, we'll present several challenges designed to stimulate your synapses and toggle the bits in your cerebral random access memory. We invite you to send your solutions to:

Commodares, c/o *Ahoy!*
P.O. Box 723
Bethel, CT 06801

We will print and discuss the cleverest, simplest, shortest, most interesting and/or most unusual solutions. Be sure to identify the *name* and *number* of the problems you are solving. Also show sample runs if possible, where appropriate. Be sure to tell what makes your solutions unique or interesting, if they are.

Programs on diskettes (1541 format only) are welcome, but they must be accompanied by listings. You must enclose a stamped, self-addressed envelope if you want any of your materials returned. Solutions received by the middle of the month shown on the magazine cover are most likely to be discussed, but you may send solutions and comments any time. Your original programming problems, suggestions, and ideas are equally welcome. The best ones will become *Commodares*!

PROBLEM #28-1: PRINT FORMATTER

This problem is from the combined suggestions of Francisco Vellejo (Bayamon, PR) and Robert Croswell (Trappe, MD). Francisco wants to be able to show any zeroes behind the decimal point when printing an amount of money. For example, 15 and 2.4 should be printed as 15.00 and 2.40. Robert suggested a routine to round off any decimal value properly to the nearest hundredth. Your challenge is to come up with the handiest way to take any number, round it to the nearest hundredth, and display the result always using two decimal places. (C-128 users have it made!) Your solution can be more general, if desired.

For an advanced challenge, Chuck Slotter (Philadelphia, PA) suggested creating a PRINT USING routine in machine language. For example, this sequence of instructions:

```
V=12.3456 : F$=" ###.##" : PRINT USING F
$; V
```

produces the result 12.35 on the C-128. What can you come up with?

PROBLEM #28-2: SIMPLE SCROLLER

The user inputs a message which is then scrolled horizontally from right to left on one line of the screen. Letters appear at the right edge of the screen. They move across to the left edge dragging the rest of the message behind. They disappear at the left edge only to reappear later at the right edge. The message may be up to 80 characters long.

PROBLEM #28-3: MATH MYSTERY

Here is a good math and/or string challenge from Ted Grondski (Springfield, MA). Simply find each seven-digit number which has all of the following properties: a) divisible by eleven, b) contains no zeroes, and c) has no two digits alike.

PROBLEM #28-4: ELEGANT ENCODER

We can count on Jim Speers (Niles, MI) to come up with interesting challenges. Here's another one. Write a program which encodes a word such that the numeric value of each letter is the sum (modulo 29) of the numeric values of the other letters in the word. (Modulo 29 simply means to take any result greater than 29, divide it by 29, discard the whole-number quotient, and keep the remainder. For example, 123 MODULO 29 = 7 since 123 divided by 29 equals 4 and 7/29. The 4 is ignored. The 7 in the numerator of the fraction is the result. Any number MODULO 29 is between 0 and 28, inclusive.)

We are adding these characters to the encoded alphabet with the following values to make a total of 29 characters: @=0, [=27, £=28. The values of A through Z are 1 through 26 respectively. Consider the word "CAT" with letter values 3, 1, and 20. The C is replaced by U, since the sum of the other two letters is 21, and U has a value of 21. The A is replaced by W, since 3+20=23. The T is replaced by D, since 3+1=4. If the user types CAT, the computer responds UWD. CATS becomes KMWX. Why 29 letters? Because 29 is prime. Next month, you will use that fact to solve the second part of this problem. You guessed it—a decoding program!

This month we will look at solutions to the *Commodares* from the December 1985 issue of *Ahoy!* Before we begin, here is a neat solution to *Problem #23-2: Rooting Routine* all the way from Ludwigsberg, Federal Republic of Germany. Although we saw solutions to this problem last month, the following program from Stephan Fassbender is different from the others, and it came with a nice mathematical explanation.

```
1 REM
2 REM PROBLEM #23-2 :
3 REM  ROOTING ROUTINE
4 REM SOLUTION BY
5 REM  STEPHAN FASSBENDER
6 REM
10 INPUT "INTEGER ";X
20 UG=INT(X/256)
```

```
30 FOR N=UG TO X
40 IF N*(N+1)<X THEN NEXT N
50 PRINT X,"INTEGER SQUARE ROOT = ";N
60 GOTO 10
```

If you are interested in the math, send a self-addressed stamped envelope to me at the address above with your request clearly specified. This is further proof that BASIC is a universal language.

Chuck Slotter (Philadelphia, PA) responded to the challenge to find a keyword which, when misspelled, still works. Chuck points out that if you type RUN over the READY. prompt, you end up with RUNDY. If the first line of your program is line 0, then RUNDY. works as desired!

The solution from Jim Speers (Niles, MI), who originally posed the question, was the END statement. If it is misspelled within a program, you will get a SYNTAX ERROR response, but the program will end all the same. Be sure to add these to your volumes of "Computer Trivia"!

Problem #24-1: Printing Permutations, suggested by Bill O'Rourke (Crystal River, FL), is a pretty tough problem. Given a quantity, the computer prints out every possible arrangement of that many numbers. The shortest solution is listed below from Allan Flippin (San Jose, CA).

```
1 REM
2 REM PROBLEM #24-1 :
3 REM  PRINTING PERMUTATIONS
4 REM SOLUTION BY
5 REM  ALLAN FLIPPIN
6 REM.
100 CLR:INPUT N:DIMC(N-1):FOR I=1 TO N:S
$=S$+CHR$(48+I):NEXT
110 I=N-1:PRINT S$,
120 S$=LEFT$(S$,I-1)+RIGHT$(S$,N-I)+MID$
(S$,I,1)
130 C(I)=C(I)+1:IF C(I)<=N-I GOTO 110
140 C(I)=0:IF I>1 THEN I=I-1 : GOTO 120
```

Allan said that his program could be modified to allow the input of letters in order to solve anagrams and other word games. Simply use the following for line 100:

```
100 INPUT S$ : N=LEN(S$) : DIM C(N-1)
```

Solutions to this problem also came from Mark Maples (Powell, TN), Matt Shapiro (Fort Lee, NJ), David Hoffner (Brooklyn, NY), Jim Speers (Niles, MI), Frank T. Smith (Wilmington, DE), James Borden (Carlisle, PA), and John Gidusko (Fern Park, FL). John Gidusko mentions that you may enter Commodore graphics symbols as well as text or numbers into his program and generate an interesting screen display. Use line 100 above and hold down the SHIFT or COMMODORE keys when you enter a string.

My approach to this problem was to implement an algorithm contained in the book *Algorithms* (Addison-Wesley, 1983) by Robert Sedgewick. The algorithm interested me because it is recursive, meaning that it calls itself. Here is a slightly modified statement of the algorithm called "visit":

procedure visit(k)
begin
now=now+1 : val(k)=now
if now=n **then** print all values of val(k)
for t=1 **to** n
if val(t)=0 **then call** visit(t)
next t
now=now−1 : val(k)=0
end.

The routine is initially called with k=0, now=−1, n equals the number of items to be permutated, and all elements of val( ) are 0 (i.e. k=0 : now=−1 : n=3 : gosub visit). The BASIC language does not handle recursive calls the way that some other languages such as Pascal and C do. Consequently my program had to keep track of its current "depth" into the visit routine.

The argument k in **procedure** visit(k) is like the argument in a BASIC function definition. When the procedure is called (in the IF/THEN statement), the variable k throughout the procedure is replaced by t. I will leave it as a challenge to you to implement this algorithm in BASIC or any other language. I will show my solution

next month.

Choosing from the dozens of solutions to *Problem #24-2: Pyramidal Printout* proposed by Nolan Whitaker (Jeffersonville, KY) was not an easy task. Many were very similar, varying in degrees of user friendliness, flexibility in printing to the screen or a printer, and the selection of BASIC functions used. The solution from Ron Weiner (Levittown, PA) listed below is representative of the approach taken by many readers.

```
1 REM
2 REM PROBLEM #24-2 :
3 REM  PYRAMIDAL PRINTOUT
4 REM SOLUTION BY
5 REM  RON WEINER
6 REM
10 OPEN 4,3:INPUT"OUTPUT TO SCREEN OR PR
INTER (S/P) ";A$:IF A$="S"GOTO 30
20 CLOSE 4 : OPEN 4,4
30 INPUT "ENTER ANY WORD WHICH HAS SAME
FIRST AND LAST LETTERS";W$
40 PRINT#4,SPC(LEN(W$)-1)LEFT$(W$,1)
50 FORI=2 TO LEN(W$)-1:PRINT#4,SPC(LEN(W
$)-I)MID$(W$,I,1)SPC(I*2-3)MID$(W$,I,1)
60 NEXT:FOR I=1 TO LEN(W$):PRINT#4,MID$(
W$,I,1)" ";:NEXT:PRINT#4:CLOSE4
```

Ron's program shows a handy way of diverting the output to a printer when desired. Although Ron chose the word "Senseless" to use as an example to show that his program works, he admitted that he had fun writing the program. And that's the idea behind *Commodares.*

A second example for *Pyramidal Printout* is shown from Lonnie Welch. His program runs on a C-64 with the COMAL 2.01 cartridge.

```
1 REM
2 REM PROBLEM #24-2 :
3 REM  PYRAMIDAL PRINTOUT
4 REM COMAL SOLUTION BY
5 REM   LONNIE WELCH
6 REM
10 :  INPUT W$
20 :  PAGE
30 :  L:=LEN(W$)
40 :  FOR T:=1 TO L-1 DO
50 :     PRINT AT T,21-T: W$(T)
60 :     PRINT AT T,19+T: W$(T)
70 :  ENDFOR T
80 :  CURSOR L,21-L
90 :  FOR T:=1 TO L DO PRINT W$(T)," ",
```

This COMAL solution shows the power of a PRINT AT function, although such a solution would not work on a printer. Evidently w$(t) refers to the "t"th character of the string w$.

There were a few solutions to *Problem #24-3: Fractional Fun* which was originally suggested by Jim Speers (Niles, MI). The problem was to find the fractional equivalent of a repeating decimal. The programs from Allan Flippin (San Jose, CA) and Ronald Jordan (Florence, OR) both determined the non-repeating and repeating parts of the input decimal by analyzing it. Ronald's program is listed below. Notice his use of the ON/GOTO as a conditional statement. The remaining statements on line 10 would have to be on a separate line if an IF/THEN statement were used instead.

```
1 REM
2 REM PROBLEM #24-3 :
3 REM  FRACTIONAL FUN
4 REM SOLUTION BY
5 REM  RONALD JORDAN
6 REM
10 INPUT"DECIMAL";N$:ON -(LEFT$(N$,1)<>"
.") GOTO 10:L=LEN(N$):FORI=L TO 1STEP-1
20 R$=MID$(N$,I):R=LEN(R$):L$=MID$(N$,I-
R,R):IF L$<>R$ THEN NEXT
30 F$=MID$(N$,2,L-R-R-1):F=LEN(F$):IF F>
2 THEN I=I-1:GOTO 20
40 D=INT(10^R-1)*10^F:N=VAL(R$)+VAL(F$)*
INT(10^R-1)
50 FOR I=2 TO 41:IF N/I=INT(N/I) THEN IF
 D/I=INT(D/I) THEN N=N/I:D=D/I:GOTO 50
60 NEXT:PRINT N"/"D
```

The other solutions, including one from Matt Shapiro (Fort Lee, NJ), required the user to specify the repeating and non-repeating parts separately. The most general solution came from Tom Gantner (Dayton, OH). His program uses Euclid's Algorithm in lines 130-160 to reduce the fraction to lowest terms. Other readers used a similar method.

```
1 REM
2 REM PROBLEM #24-3 :
3 REM  FRACTIONAL FUN
4 REM SOLUTION BY
5 REM  TOM GANTNER
6 REM
30 INPUT"NON-REPEATING DIGITS: 0.";A$
40 INPUT"     REPEATING DIGITS: ";B$
50 IF B$="" THEN B$="0"
60 L=LEN(A$):M=LEN(B$)
70 IF L+M>9 THEN PRINT"TOO MANY DIGITS":
GOTO 30
80 P=VAL(A$+B$)-VAL(A$):Q$=""
90 FOR I=1 TO M:Q$=Q$+"9":NEXT I
100 IF L=0 GOTO 120
110 FOR I=1 TO L:Q$=Q$+"0":NEXT I
120 Q=VAL(Q$):A=P:B=Q
130 QU=INT(A/B):RM=A-B*QU
140 IF RM=0 THEN D=B:GOTO 160
150 A=B:B=RM:GOTO 130
160 P=P/D:Q=Q/D
170 PRINT:PRINT"0."+A$+"'"+B$+"' =";P;"/
";Q
180 END
```

There were two approaches to *Problem #24-4: Sector Status*. The problem was to determine whether a specific track and sector of a disk was being used or not. The less desirable approach was to send a "block-allocate" command to the disk drive. The error channel was checked to see if an error number 65 was received, indicating that the sector had already been allocated ("used"). The method should work, but if the sector was previously unused, the block-allocate command now marks it as being used. Consequently a block-free command must be sent to de-allocate that sector.

According to the *1541 User's Guide* (Datamost, 1984) by Dr. Gerald Neufeld, the block-allocate command works correctly only if the designated block is free in the Block Availability Map (BAM). Otherwise the entire sector is allocated. A Validate command is needed to restore these marked but unused sectors.

A program which is simply to *read* the availability of a given track and sector on a disk should not have the capability of modifying the disk (or even the BAM image in memory) in any way. Therefore we will look at the solutions which merely read and interpret the BAM.

After the disk drive is initialized, the BAM is read from the disk and stored in a buffer at addresses $0700 through $07FF (the $ indicates hexadecimal values). Each track has three bytes associated with it which provide a bit map representation of the sectors within the track. Since no track contains more than 20 sectors, three bytes (24 bits) is more than adequate.

The location of the byte corresponding to track T and sector S is at address $0700 plus (4*T + INT(S/8) + 1). The bit corresponding to sector S has a value (2 (S AND 7)). A bit value of 0 indicates that the corresponding sector is allocated, and a bit value of 1 means the sector is free.

The disk Memory-Read command has the format "M–R"CHR$(low byte)CHR$(high byte). "Low byte" and "high byte" refer to the least significant and most significant bytes of the desired memory address. For example, address $0705 has a most significant byte of $07 and a least significant byte of $05.

With the explanation behind, here's a program which implements the above sequence, from Barry Parris (Gaffney, SC). It is very similar to programs received from Rick Nash (Millersburg, OH), Allan Flippin (San Jose, CA), and Matt Shapiro (Fort Lee, NJ).

```
1 REM
2 REM PROBLEM #24-4 :
3 REM  SECTOR STATUS
4 REM SOLUTION BY
5 REM  BARRY PARRIS
6 REM
10 OPEN15,8,15,"I0":INPUT"TRACK, SECTOR"
;T,S
20 PRINT#15,"M-R"CHR$(4*T+INT(S/8)+1)CHR
$(7):GET#15,A$:CLOSE15
30 A=ASC(A$+CHR$(0)):IF (A AND 2^(S AND
7)) THEN PRINT"UNUSED":END
40 PRINT"USED"
```

The "I0" command in the OPEN statement reads the BAM into memory. The other statements perform the remaining operations. You should add some error-checking if you are writing a program that someone else might use. The following lines from Jim Speers (Niles, MI) check for valid track and sector values, and could be added to the program above.

```
1 REM
2 REM PROBLEM #24-4 :
3 REM  SECTOR STATUS
4 REM ERROR CHECKING BY
5 REM    JIM SPEERS
6 REM
7 REM ADD THESE LINES TO
8 REM THE PREVIOUS PROGRAM
9 REM
11 IF T<36 AND S<17 THEN 20
12 IF S>20 OR T>35 THEN 50
13 IF S=17 AND T>30 THEN 50
14 IF S=18 AND T>24 THEN 50
15 IF S>18 AND T>17 THEN 50
50 PRINT"IMPROPER TRACK OR SECTOR NUMBER
"
```

The world of the 1541 disk drive can be very mysterious. Thanks to Larry West (Prince George, BC), Jim Cagle, Jose Molina (Homestead, FL), Carlton Burton (Easton, TX), and Peter Spearing (Northfield, OH), in addition to the people mentioned earlier for their work on this problem and for their very informative descriptions of the solutions to this problem.

Other readers who submitted valid solutions to *Commodares* this month and have not already been mentioned include Jack O. Foley (Goldsboro, NC), Douglas Underwood (Walla Walla, WA), Richard MacDonald (Danbury, CT), John Freel (Merced, CA), Charles Grady(Cleveland, TN), Daniel Daugherty (Parsons, TN), Paul L. Ramos, Steven Steckler (Columbia, MD), James Killman (Memphis, TN), Gary Hudach (Youngstown, OH), Wallace Leeker (Lemay, MO), Brian Wilcox (Coldwater, OH), B. Gregg Price (Beaumont, TX), Mark Breault (Brandon, MAN), L. W. Brenneman (Erie, PA), Tom Frankson (Bolingbrook, IL), David Dill (Giddings, TX), and Pedro H. Ortiz (Bayamon, PR).

Your comments and challenges are always welcome. Some readers have sent good suggestions for *Commodares*, but they are problems which we have used before. If there is a way to modify your suggestion so that it is not an exact duplicate of a previous problem, we will use it. Since some of you readers have more than two additional years of programming experience under your belts now than when you solved the first *Commodares*, perhaps you would enjoy redoing some of the earlier challenges. Let me know what you think. Until next month, have fun with these challenges. □

PROGRAM LISTINGS

Attention new *Ahoy!* readers! You must read the following information very carefully prior to typing in programs listed in *Ahoy!* Certain Commodore characters, commands, and strings of characters and commands will appear in a special format. Follow the instructions and listing guide on this page.

On the following pages you'll find several programs that you can enter on your Commodore computer. But before doing so, read this entire page carefully.

To insure clear reproductions, *Ahoy!*'s program listings are generated on a daisy wheel printer, incapable of printing the commands and graphic characters used in Commodore programs. These are therefore represented by various codes enclosed in brackets [ ]. For example: the SHIFT CLR/HOME command is represented onscreen by a heart. The code we use in our listings is [CLEAR]. The chart below lists all such codes which you'll encounter in our listings, except for one other special case.

The other special case is the COMMODORE and SHIFT characters. On the front of most keys are two symbols. The symbol on the left is obtained by pressing that key while holding down the COMMODORE key; the symbol on the right, by pressing that key while holding down the SHIFT key. COMMODORE and SHIFT characters are represented in our listings by a lower-case "s" or "c" followed by the symbol of the key you must hit. COMMODORE J, for example, is represented by [c J], and SHIFT J by [s J].

Additionally, any character that occurs more than two times in a row will be displayed by a coded listing. For example, [3 "[LEFT]"] would be 3 CuRSoR left commands in a row, [5 "[s EP]"] would be 5 SHIFTed English Pounds, and so on. Multiple blank spaces will be noted in similar fashion: e.g., 22 spaces as [22 " "].

Sometimes you'll find a program line that's too long for the computer to accept (C-64 lines are a maximum of 80 characters, or 2 screen lines long; VIC 20 lines, a maximum of 88 characters, or 4 screen lines). To enter these lines, refer to the *BASIC Command Abbreviations Appendix* in your User Manual.

On the next page you'll find our *Bug Repellent* programs for the VIC 20 and C-64. The version appropriate for your machine will help you proofread our programs after you type them. (Please note: the *Bug Repellent* line codes that follow each program line, in the whited-out area, should *not* be typed in. See the instructions preceding each program.)

Also on the following page you will find *Flankspeed*, our ML entry program, and instructions on its use. □

Call *Ahoy!* at 212-239-0855 with any problems.

When You See	It Means	You Type		You Will See
[CLEAR]	Screen Clear	SHIFT	CLR/HOME	
[HOME]	Home		CLR/HOME	
[UP]	Cursor Up	SHIFT	↑CRSR↓	
[DOWN]	Cursor Down		↑CRSR↓	
[LEFT]	Cursor Left	SHIFT	←CRSR→	
[RIGHT]	Cursor Right		←CRSR→	
[SS]	Shifted Space	SHIFT	Space	
[INSERT]	Insert	SHIFT	INST/DEL	
[DEL]	Delete		INST/DEL	
[RVSON]	Reverse On	CNTRL	9	
[RVSOFF]	Reverse Off	CNTRL	0	
[UPARROW]	Up Arrow		↑	
[BACKARROW]	Back Arrow		←	
[PI]	PI		π	
[EP]	English Pound		£	

When You See	It Means	You Type		You Will See
[BLACK]	Black	CNTRL	1	
[WHITE]	White	CNTRL	2	
[RED]	Red	CNTRL	3	
[CYAN]	Cyan	CNTRL	4	
[PURPLE]	Purple	CNTRL	5	
[GREEN]	Green	CNTRL	6	
[BLUE]	Blue	CNTRL	7	
[YELLOW]	Yellow	CNTRL	8	
[F1]	Function 1		F1	
[F2]	Function 2	SHIFT	F1	
[F3]	Function 3		F3	
[F4]	Function 4	SHIFT	F3	
[F5]	Function 5		F5	
[F6]	Function 6	SHIFT	F5	
[F7]	Function 7		F7	
[F8]	Function 8	SHIFT	F7	

IMPORTANT! Letters on white background are **Bug Repellent** line codes. **Do not enter them!** This page and page 105 explain these codes and provide other essential information on entering ***Ahoy!*** programs. Read these pages **before** entering programs!

BUG REPELLENT

This program will let you debug any *Ahoy!* program. Follow instructions for VIC 20 (cassette or disk) or C-64.

VIC 20 VERSION

By Michael Kleinert and David Barron

For cassette: type in and save the *Bug Repellent* program, then type RUN 63000[RETURN]SYS 828[RETURN]. If you typed the program properly, it will generate a set of two-letter line codes that will match those listed to the right of the respective program lines.

Once you've got a working *Bug Repellent*, type in the program you wish to check. Save it and type the RUN and SYS commands listed above once again, then compare the line codes generated to those listed in the magazine. If you spot a discrepancy, a typing error exists in that line. Important: you must use exactly the same spacing as the program in the magazine. Due to memory limitations on the VIC, the VIC *Bug Repellent* will register an error if your spacing varies from what's printed.

You may type SYS 828 as many times as you wish, but if you use the cassette for anything, type RUN 63000 to restore the *Repellent*.

When your program has been disinfected you may delete all lines from 63000 on. (Be sure the program you type doesn't include lines above 63000!)

For disk: enter *Bug Repellent*, save it, and type RUN:NEW [RETURN]. Type in the program you wish to check, then SYS 828.

To pause the line codes listing, press SHIFT.

To send the list to the printer type OPEN 4,4:CMD 4:SYS 828[RETURN]. When the cursor comes back, type PRINT#4:CLOSE 4[RETURN].

```
•63000 FORX=828TO1023:READY:POKEX,Y:NEXT:END   AC
•63001 DATA169,0,133,63,133,64,165,43,133,251  JL
•63002 DATA165,44,133,252,160,0,132,254,32,228 DF
•63003 DATA3,234,177,251,208,3,76,208,3,230    OE
•63004 DATA251,208,2,230,252,169,244,160,3,32  OH
•63005 DATA30,203,160,0,177,251,170,230,251,20
 8                                             KO
•63006 DATA2,230,252,177,251,32,205,221,169,58 JJ
•63007 DATA32,210,255,169,0,133,253,230,254,32 OK
•63008 DATA228,3,234,165,253,160,0,170,177,251 LG
•63009 DATA201,32,240,6,138,113,251,69,254,170 BP
•63010 DATA138,133,253,177,251,208,226,165,253
 ,41                                           DD
•63011 DATA240,74,74,74,74,24,105,65,32,210    EK
•63012 DATA255,165,253,41,15,24,105,65,32,210  FO
•63013 DATA255,169,13,32,210,255,173,141,2,41  PK
•63014 DATA1,208,249,230,63,208,2,230,64,230   CB
•63015 DATA251,208,2,230,252,76,74,3,169,236   KH
•63016 DATA160,3,32,30,203,166,63,165,64,32    DP
•63017 DATA205,221,169,13,32,210,255,96,230,25
 1                                             EL
•63018 DATA208,2,230,252,96,0,76,73,78,69      OI
•63019 DATA83,58,32,0,76,73,78,69,32,35        FG
•63020 DATA32,0,0,0,0,0                        LE
```

C-64 VERSION

By Michael Kleinert and David Barron

Type in, SAVE, and RUN the *Bug Repellent*. Type NEW, then type in or LOAD the *Ahoy!* program you wish to check. When that's done, SAVE your program (don't RUN it!) and type SYS 49152 [RETURN].

To pause the listing depress and hold the SHIFT key.

Compare the codes your machine generates to the codes listed to the right of the respective program lines. If you spot a difference, an error exists in that line. Jot down the number of lines where contradictions occur, LIST each line, spot the errors, and correct them.

```
•5000 FORX=49152TO49488:READY:POKEX,Y:NEXT:END GJ
•5001 DATA32,161,192,165,43,133,251,165,44,133 DL
•5002 DATA252,160,0,132,254,32,37,193,234,177  DB
•5003 DATA251,208,3,76,138,192,230,251,208,2   OF
•5004 DATA230,252,76,43,192,76,73,78,69,32     KN
•5005 DATA35,32,0,169,35,160,192,32,30,171     CA
•5006 DATA160,0,177,251,170,230,251,208,2,230  CE
•5007 DATA252,177,251,32,205,189,169,58,32,210 JE
•5008 DATA255,169,0,133,253,230,254,32,37,193  CL
•5009 DATA234,165,253,160,0,76,13,193,133,253  NB
•5010 DATA177,251,208,237,165,253,41,240,74,74 MB
•5011 DATA74,74,24,105,65,32,210,255,165,253   EP
•5012 DATA41,15,24,105,65,32,210,255,169,13    GH
•5013 DATA32,220,192,230,63,208,2,230,64,230   AN
•5014 DATA251,208,2,230,252,76,11,192,169,153  NG
•5015 DATA160,192,32,30,171,166,63,165,64,76   BF
•5016 DATA231,192,96,76,73,78,69,83,58,32      EP
•5017 DATA0,169,247,160,192,32,30,171,169,3    PJ
•5018 DATA133,254,32,228,255,201,83,240,6,201  FK
•5019 DATA80,208,245,230,254,32,210,255,169,4  FL
•5020 DATA166,254,160,255,32,186,255,169,0,133 CL
•5021 DATA63,133,64,133,2,32,189,255,32,192    GC
•5022 DATA255,166,254,32,201,255,76,73,193,96  NN
•5023 DATA32,210,255,173,141,2,41,1,208,249    NH
•5024 DATA96,32,205,189,169,13,32,210,255,32   IM
•5025 DATA204,255,169,4,76,195,255,147,83,67   KC
•5026 DATA82,69,69,78,32,79,82,32,80,82        DC
•5027 DATA73,78,84,69,82,32,63,32,0,76         ML
•5028 DATA44,193,234,177,251,201,32,240,6,138  GN
•5029 DATA113,251,69,254,170,138,76,88,192,0   JK
•5030 DATA0,0,0,230,251,208,2,230,252,96       NA
•5031 DATA170,177,251,201,34,208,6,165,2,73    DM
•5032 DATA255,133,2,165,2,208,218,177,251,201  JA
•5033 DATA32,208,212,198,254,76,29,193,0,169   FM
•5034 DATA13,76,210,255,0,0,0                  PA
```

FLANKSPEED FOR THE C-64

By Gordon F. Wheat

Flankspeed will allow you to enter machine language *Ahoy!* programs without any mistakes. Once you have typed the program in, save it for future use. While entering an ML program with *Flankspeed* there is no need to enter spaces or hit the carriage return. This is all done automatically. If you make an error in a line a bell will ring and you will be asked to enter it again. To LOAD in a program Saved with *Flankspeed* use LOAD "name",1,1 for tape, or LOAD "name",8,1 for disk. The function keys may be used after the starting and ending addresses have been entered.

f1 – SAVEs what you have entered so far.

f3 – LOADs in a program worked on previously.

f5 – To continue on a line you stopped on after LOADing in the previously saved work.

f7 – Scans through the program to locate a particular line, or to find out where you stopped the last time you entered the program. f7 temporarily freezes the output as well.

```
•5 POKE53280,12:POKE53281,11                   LL
•6 PRINT"[CLEAR][c 8][RVSON][15" "]FLANKSPEED[
 15" "]";                                      ED
•10 PRINT"[RVSON][5" "]MISTAKEPROOF ML ENTRY P
 ROGRAM[6" "]"                                 MC
•15 PRINT"[RVSON][9" "]CREATED BY G. F. WHEAT[
 9" "]"                                        DM
•20 PRINT"[RVSON][3" "]COPR. 1984, ION INTERNA
```

```
TIONAL INC.[3" "]"                             DH
30 FORA=54272TO54296:POKEA,0:NEXT              IM
40 POKE54272,4:POKE54273,48:POKE54277,0:POKE5
4278,249:POKE54296,15                          NH
70 FORA=680TO699:READB:POKEA,B:NEXT            KO
75 DATA169,251,166,253,164,254,32,216,255,96   HJ
76 DATA169,0,166,251,164,252,32,213,255,96     JB
80 B$="STARTING ADDRESS IN HEX":GOSUB2010:AD=
B:SR=B                                         HC
85 GOSUB2520:IFB=0THEN80                       FO
86 POKE251,T(4)+T(3)*16:POKE252,T(2)+T(1)*16   KE
90 B$="ENDING ADDRESS IN HEX":GOSUB2010:EN=B   IF
95 GOSUB2510:IFB=0THEN80                       FP
96 POKE254,T(2)+T(1)*16:B=T(4)+1+T(3)*16       MN
97 IFB>255THENB=B-255:POKE254,PEEK(254)+1      GE
98 POKE253,B:PRINT                             HN
100 REM  GET HEX LINE                          IL
110 GOSUB3010:PRINT": [c P][LEFT]";:FORA=0TO8  FG
120 FORB=0TO1:GOTO210                          MD
125 NEXTB                                      ME
130 A%(A)=T(1)+T(0)*16:IFAD+A-1=ENTHEN310      LH
135 PRINT" [c P][LEFT]";                       IK
140 NEXTA:T=AD-(INT(AD/256)*256):PRINT" "      PD
150 FORA=0TO7:T=T+A%(A):IFT>255THENT=T-255     LK
160 NEXT                                       IA
170 IFA%(8)<>TTHENGOSUB1010:GOTO110            FK
180 FORA=0TO7:POKEAD+A,A%(A):NEXT:AD=AD+8:GOT
0110                                           MN
200 REM    GET HEX INPUT                       AB
210 GETA$:IFA$=""THEN210                       HO
211 IFA$=CHR$(20)THEN270                       GC
212 IFA$=CHR$(133)THEN4000                     MD
213 IFA$=CHR$(134)THEN4100                     KF
214 IFA$=CHR$(135)THENPRINT" ":GOTO4500        GE
215 IFA$=CHR$(136)THENPRINT" ":GOTO4700        BJ
220 IFA$>"@"ANDA$<"G"THENT(B)=ASC(A$)-55:GOTO
250                                            GM
230 IFA$>"/"ANDA$<":"THENT(B)=ASC(A$)-48:GOTO
250                                            LE
240 GOSUB1100:GOTO210                          LL
250 PRINTA$"[c P][LEFT]";                      OA
260 GOTO125                                    CG
270 IFA>0THEN280                               OP
272 A=-1:IFB=1THEN290                          OB
274 GOTO140                                    CJ
280 IFB=0THENPRINTCHR$(20);CHR$(20);:A=A-1     HG
285 A=A-1                                      BE
290 PRINTCHR$(20);:GOTO140                     KH
300 REM LAST LINE                              AD
310 PRINT" ":T=AD-(INT(AD/256)*256)            GJ
320 FORB=0TOA-1:T=T+A%(B):IFT>255THENT=T-255   PL
330 NEXT                                       IA
340 IFA%(A)<>TTHENGOSUB1010:GOTO110            KF
350 FORB=0TOA-1:POKEAD+B,A%(B):NEXT            HN
360 PRINT:PRINT"YOU ARE FINISHED!":GOTO4000    ON
1000 REM BELL AND ERROR MESSAGES               FL
1010 PRINT:PRINT"LINE ENTERED INCORRECTLY":PR
INT:GOTO1100                                   DH
1020 PRINT:PRINT"INPUT A 4 DIGIT HEX VALUE!":
GOTO1100                                       JA
1030 PRINT:PRINT"ENDING IS LESS THAN STARTING
!":B=0:GOTO1100                                HD
1040 PRINT:PRINT"ADDRESS NOT WITHIN SPECIFIED
 RANGE!":B=0:GOTO1100                          AG
1050 PRINT:PRINT"NOT ZERO PAGE OR ROM!":B=0:G
OTO1100                                        KN
1060 PRINT"?ERROR IN SAVE":GOTO1100            EI
1070 PRINT"?ERROR IN LOAD":GOTO1100            GL
1080 PRINT:PRINT:PRINT"END OF ML AREA":PRINT   PG
1100 POKE54276,17:POKE54276,16:RETURN          BH
1200 OPEN15,8,15:INPUT#15,A,A$:CLOSE15:PRINTA
$:RETURN                                       IM
2000 REM GET FOUR DIGIT HEX                    PC
2010 PRINT:PRINTB$;:INPUTT$                    GM
2020 IFLEN(T$)<>4THENGOSUB1020:GOTO2010        II
2040 FORA=1TO4:A$=MID$(T$,A,1):GOSUB2060:IFT(
A)=16THENGOSUB1020:GOTO2010                    AD
2050 NEXT:B=(T(1)*4096)+(T(2)*256)+(T(3)*16)+
T(4):RETURN                                    GF
2060 IFA$>"@"ANDA$<"G"THENT(A)=ASC(A$)-55:RET
URN                                            EH
2070 IFA$>"/"ANDA$<":"THENT(A)=ASC(A$)-48:RET
URN                                            KP
2080 T(A)=16:RETURN                            NP
2500 REM ADRESS CHECK                          LI
2510 IFAD>ENTHEN1030                           MI
2515 IFB<SRORB>ENTHEN1040                      MG
2520 IFB<256OR(B>40960ANDB<49152)ORB>53247THE
N1050                                          MI
2530 RETURN                                    IM
3000 REM ADDRESS TO HEX                        EB
3010 AC=AD:A=4096:GOSUB3070                    HG
3020 A=256:GOSUB3070                           CE
3030 A=16:GOSUB3070                            PN
3040 A=1:GOSUB3070                             MJ
3060 RETURN                                    IM
3070 T=INT(AC/A):IFT>9THENA$=CHR$(T+55):GOTO3
090                                            CJ
3080 A$=CHR$(T+48)                             JP
3090 PRINTA$;:AC=AC-A*T:RETURN                 AC
4000 A$="**SAVE**":GOSUB4200                   AI
4050 OPEN1,T,1,A$:SYS680:CLOSE1                LH
4060 IFST=0THENEND                             EO
4070 GOSUB1060:IFT=8THENGOSUB1200              FJ
4080 GOTO4000                                  FF
4100 A$="**LOAD**":GOSUB4200                   AB
4150 OPEN1,T,0,A$:SYS690:CLOSE1                MF
4160 IFST=64THEN110                            JH
4170 GOSUB1070:IFT=8THENGOSUB1200              CM
4180 GOTO4100                                  FO
4200 PRINT" ":PRINTTAB(14)A$                   FG
4210 PRINT:A$="":INPUT"FILENAME";A$            OM
4215 IFA$=""THEN4210                           GF
4220 PRINT:PRINT"TAPE OR DISK?":PRINT          DF
4230 GETB$:T=1:IFB$="D"THENT=8:A$="@0:"+A$:RE
TURN                                           IG
4240 IFB$<>"T"THEN4230                         FN
4250 RETURN                                    IM
4500 B$="CONTINUE FROM ADDRESS":GOSUB2010:AD=
B                                              DK
4510 GOSUB2515:IFB=0THEN4500                   MA
4520 PRINT:GOTO110                             OI
4700 B$="BEGIN SCAN AT ADDRESS":GOSUB2010:AD=
B                                              FH
4705 GOSUB2515:IFB=0THEN4700                   NK
4706 PRINT:GOTO4740                            DI
4710 FORB=0TO7:AC=PEEK(AD+B):GOSUB3030:IFAD+B
=ENTHENAD=SR:GOSUB1080:GOTO110                 BK
4715 PRINT" ";:NEXTB                           EC
4720 PRINT:AD=AD+8                             GN
4730 GETB$:IFB$=CHR$(136)THEN110               MN
4740 GOSUB3010:PRINT": ";:GOTO4710             JD
```

IMPORTANT! Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 105 and 106 explain these codes and provide other essential information on entering ***Ahoy!*** programs. Refer to these pages **before** entering any programs!

HIDDEN CAVERN
FROM PAGE 57

```
·10 REM    HIDDEN CAVERN                      OK
·12 REM    BY JAMES C.HILTY                   LI
·14 POKE52,48:POKE56,48                       IC
·16 PRINT"[CLEAR]":POKE53281,15:POKE53280
 ,0                                           BM
·20 REM    TITLE SCREEN                       NG
·22 PRINT:PRINTTAB(4)"[BLACK][RVSON] [RVS
 OFF] [RVSON] [RVSOFF]  [RVSON] [RVSOFF]
  [RVSON]  [c *][RVSOFF]  [RVSON]  [c *][
 RVSOFF]  [RVSON][3" "][RVSOFF]  [RVSON][
 c *][RVSOFF] [RVSON] "                       HK
·24 PRINTTAB(4)"[BLACK][RVSON] [RED] [BLA
 CK] [RED] [RVSOFF] [RVSON][BLACK] [RED]
 [RVSOFF] [RVSON][BLACK] [RED]  [c *][RVS
 OFF] [RVSON][BLACK] [RED]  [c *][RVSOFF]
  [RVSON][BLACK] [RED][3" "][RVSOFF] [RVS
 ON][BLACK] [RED][c *][BLACK] [RED] "         GN
·26 PRINTTAB(4)"[RVSON][BLACK] [RED] [BLA
 CK] [RED] [RVSOFF] [RVSON][BLACK] [RED]
 [RVSOFF] [RVSON][BLACK] [RED][3" "][RVSO
 FF] [RVSON][BLACK] [RED][3" "][RVSOFF] [
 RVSON][BLACK] [RED] [RVSOFF][3" "][RVSON
 ][BLACK] [RED] [BLACK] [RED] "               DP
·28 PRINTTAB(4)"[RVSON][BLACK] [RED] [BLA
 CK] [RED] [RVSOFF] [RVSON][BLACK] [RED]
 [RVSOFF] [RVSON][BLACK] [RED] [BLACK] [R
 ED] [RVSOFF] [RVSON][BLACK] [RED] [BLACK
 ] [RED] [RVSOFF] [RVSON][BLACK] [RED] [B
 LACK] [RVSOFF]  [RVSON][BLACK] [RED][3"
 "]"                                          KK
·30 PRINTTAB(4)"[RVSON][BLACK] [RED][3" "
 ][RVSOFF] [RVSON][BLACK] [RED] [RVSOFF]
 [RVSON][BLACK] [RED] [BLACK] [RED] [RVSO
 FF] [RVSON][BLACK] [RED] [BLACK] [RED] [
 RVSOFF] [RVSON][BLACK] [RED]  [RVSOFF]
 [RVSON][BLACK] [RED][3" "]"                  FL
·32 PRINTTAB(4)"[RVSON][BLACK] [RED] [BLA
 CK] [RED] [RVSOFF] [RVSON][BLACK] [RED]
 [RVSOFF] [RVSON][BLACK] [RED] [BLACK] [R
 ED] [RVSOFF] [RVSON][BLACK] [RED] [BLACK
 ] [RED] [RVSOFF] [RVSON][BLACK] [RED] [R
 VSOFF][3" "][RVSON][BLACK] [RED][3" "]"      PB
·34 PRINTTAB(4)"[RVSON][BLACK] [RED] [BLA
 CK] [RED] [RVSOFF] [RVSON][BLACK] [RED]
 [RVSOFF] [RVSON][BLACK] [RED][3" "][RVSO
 FF] [RVSON][BLACK] [RED][3" "][RVSOFF] [
 RVSON][BLACK] [RED] [BLACK] [RVSOFF]  [R
 VSON][BLACK] [RED] [RVSOFF][c *][RVSON]
 "                                            JM
·36 PRINTTAB(5)"[RVSON][RED] [RVSOFF] [RV
 SON] [RVSOFF]  [RVSON] [RVSOFF]  [RVSON]
 [RVSOFF][sEP]  [RVSON]  [RVSOFF][sEP]
 [RVSON][3" "][RVSOFF]  [RVSON] [RVSOFF]
  [c *]"                                      DP
·38 PRINT:PRINT                               GJ
·40 PRINTTAB(6)"[RVSON][BLUE][3" "][RVSOF
 F][3" "][RVSON] [RVSOFF][3" "][RVSON] [R
 VSOFF] [RVSON] [RVSOFF]  [RVSON][3" "][R
 VSOFF]  [RVSON][3" "][RVSOFF]  [RVSON][c
  *][RVSOFF] [RVSON] "                        JN
·42 PRINTTAB(6)"[RVSON][BLUE] [BLACK][3"
 "][RVSOFF] [RVSON][BLUE][sEP] [c *][RVSO
 FF]  [RVSON] [BLACK] [BLUE] [BLACK] [RVS
 OFF] [RVSON][BLUE] [BLACK][3" "][RVSOFF]
  [RVSON][BLUE] [BLACK] [BLUE] [BLACK] [R
 VSOFF] [RVSON][BLUE] [c *] [BLACK] "         DP
·44 PRINTTAB(6)"[RVSON][BLUE] [BLACK] [RV
 SOFF][3" "][RVSON][BLUE] [BLACK][sEP][BL
 UE] [BLACK][c *][RVSOFF] [RVSON][BLUE] [
 BLACK] [BLUE] [BLACK] [RVSOFF] [RVSON][B
 LUE] [BLACK] [RVSOFF][3" "][RVSON][BLUE]
 [3" "][BLACK] [RVSOFF] [RVSON][BLUE][3"
 "][BLACK] "                                  MA
·46 PRINTTAB(6)"[RVSON][BLUE] [BLACK] [RV
 SOFF][3" "][RVSON][BLUE][3" "][BLACK] [R
 VSOFF] [RVSON][BLUE] [BLACK] [BLUE] [BLA
 CK] [RVSOFF] [RVSON][BLUE]  [RVSOFF][3"
 "][RVSON]  [BLACK]  [RVSOFF] [RVSON][BLU
 E][3" "][BLACK] "                            CO
·48 PRINTTAB(6)"[RVSON][BLUE] [BLACK] [RV
 SOFF][3" "][RVSON][BLUE] [BLACK] [BLUE]
 [BLACK] [RVSOFF] [RVSON][BLUE] [BLACK] [
 BLUE] [BLACK] [RVSOFF] [RVSON][BLUE] [BL
 ACK]  [RVSOFF]  [RVSON][BLUE][3" "][RVSO
 FF]  [RVSON][3" "][BLACK] "                  BL
·52 PRINTTAB(6)"[RVSON][BLUE][3" "][RVSOF
 F]  [RVSON] [BLACK] [BLUE] [BLACK] [RVSO
 FF]  [RVSON][BLUE] [BLACK] [RVSOFF][sEP]
  [RVSON][BLUE][3" "][RVSOFF]  [RVSON] [B
 LACK] [BLUE] [BLACK] [RVSOFF] [RVSON][BL
 UE] [BLACK] [RVSOFF][BLUE][c *][RVSON][B
 LACK] "                                      KB
·54 PRINTTAB(7)"[RVSON][BLACK][3" "][RVSO
 FF]  [RVSON] [RVSOFF] [RVSON] [RVSOFF][3
 " "][RVSON] [RVSOFF][3" "][RVSON][3" "][
 RVSOFF]  [RVSON] [RVSOFF] [RVSON] [RVSOF
 F]  [RVSON] [RVSOFF] [c *]"                  OJ
·56 PRINT:PRINTTAB(9)"[BLUE]LAND OF THE C
 AVE GLOBS"                                   JN
·60 FORL=54272TO54295:POKEL,0:NEXT:POKE54
 296,15:POKE54277,8:POKE54278,255             KC
·62 POKE54276,21:F1=2:FORZ=1TO28:F2=80:PO
 KE54273,F1:FORY=1TO5:POKE54287,F2            LC
·64 F2=F2/0.9:NEXTY:F1=F1+9:NEXTZ:POKE542
 78,15                                        PL
·66 PRINTTAB(6)"PLEASE WAIT[4"."]READING
 DATA"                                        EE
```

```
·68 REM    READ SPRITE SHAPE DATA           FG
·70 FORX=12288TO12350:READA:POKEX,A:NEXT    NM
·72 FORX=12352TO12414:READA:POKEX,A:NEXT    LH
·74 FORX=12416TO12478:READA:POKEX,A:NEXT    LO
·76 FORX=12480TO12542:READA:POKEX,A:NEXT    KD
·78 FORX=12544TO12606:READA:POKEX,A:NEXT    LH
·80 FORX=12608TO12670:READA:POKEX,A:NEXT    LH
·82 FORX=12672TO12734:READA:POKEX,A:NEXT    KL
·84 FORX=12736TO12798:READA:POKEX,A:NEXT    LO
·86 FORX=12800TO12862:READA:POKEX,A:NEXT    IK
·88 REM    READ SCROLL DATA                 KL
·90 FORX=49152TO49528:READA:POKEX,A:NEXT    LP
·92 REM    READ SPRITE MOTION ROUTINE       EL
·94 FORX=50880TO51116:READA:POKEX,A:NEXT    ND
·96 V=53248                                 AD
·97 HS=0                                    IC
·98 REM    SET UP PLAYING SCREEN            CB
·99 SC=0:M=0:SH=3                           JF
·100 POKE53280,0:POKE53281,0:PRINT"[CLEAR
 ][CYAN][7"[c O]"] [7"[c O]"]  [8"[c O]"]
 [6" "][8"[c O]"]"                          JP
·102 PRINT"[c J]SCORE[c L] [c J]SHIPS[c L
 ]  [c J]HIDDEN[c L][6" "][c J]MISSES[c L
 ]"                                         IP
·104 PRINT"[7"[c U]"] [7"[c U]"]  [c J]CA
 VERN[c L][6" "][8"[c U]"]"                 BK
·106 PRINTTAB(17)"[8"[c U]"]"               BA
·108 PRINT"[GREEN][RVSON][39" "]"           GP
·110 PRINTTAB(2)"[RVSON][3" "][RVSOFF][5"
 "][RVSON][4" "][RVSOFF][4" "][RVSON][4"
 "][RVSOFF][3" "][RVSON]  [RVSOFF][3" "]
 [RVSON]  [RVSOFF][4" "][RVSON]  "          FL
·112 PRINTTAB(2)"[RVSON][3" "][RVSOFF][5"
 "][RVSON]  [RVSOFF][7" "][RVSON]  [RVSO
 FF][4" "][RVSON] [RVSOFF][4" "][RVSON] [
 RVSOFF][5" "][RVSON]  "                    JL
·114 PRINTTAB(3)"[RVSON] [RVSOFF][6" "][R
 VSON] [RVSOFF][8" "][RVSON]  [RVSOFF][4"
 "][RVSON] [RVSOFF][4" "][RVSON] [RVSOFF
 ][5" "][RVSON]  "                          JC
·116 PRINTTAB(3)"[RVSON] [RVSOFF][6" "][R
 VSON] [RVSOFF][RVSOFF][8" "][RVSON]  [RV
 SOFF][4" "][c K][4" "][c K][5" "][RVSON]
  "                                         OF
·118 PRINTTAB(3)"[RVSON] [RVSOFF][6" "][c
  K][8" "][RVSON]  [RVSOFF][9" "][c K][6"
  "][RVSON] "                               OO
·120 PRINTTAB(3)"[c K][6" "][c K][8" "][R
 VSON] [RVSOFF][10" "][c H][6" "][RVSON]
 "                                          FJ
·122 PRINTTAB(3)"[c K][15" "][RVSON] [RVS
 OFF][17" "][c L]"                          FA
·124 PRINTTAB(3)"[c K][15" "][RVSON] [RVS
 OFF][17" "][c L]"                          FA
·126 PRINTTAB(3)"[c K][15" "][RVSON] [RVS
 OFF][17" "][c L]"                          FA
·128 PRINTTAB(19)"[c H]"                    LK
·130 PRINT:PRINTTAB(11)"[c J][20" "][c L]
 "                                          JK
·132 PRINTTAB(11)"[c J][20" "][c L]"        OO
·134 PRINTTAB(2)"[c K][8" "][RVSON] [RVSO
 FF][12" "][c K][7" "][c L] "               LE
·136 PRINTTAB(2)"[c K][8" "][RVSON] [RVSO
 FF][12" "][RVSON] [RVSOFF][6" "][RVSON]
  "                                         ED
·138 PRINTTAB(2)"[RVSON] [RVSOFF][8" "][R
 VSON]  [RVSOFF][11" "][RVSON] [RVSOFF][6
 " "][RVSON]  "                             NP
·140 PRINTTAB(2)"[RVSON] [RVSOFF][8" "][R
 VSON]  [RVSOFF][11" "][RVSON] [RVSOFF][5
 " "][RVSON][3" "]"                         BP
·142 PRINTTAB(2)"[RVSON] [RVSOFF][7" "][R
 VSON][4" "][RVSOFF][9" "][RVSON][3" "][R
 VSOFF][4" "][RVSON][3" "]"                 PD
·144 PRINT"[RVSON][39" "]"                  GO
·146 POKE49522,2:POKE49523,0:POKE49524,38
 :POKE49525,5:POKE49526,22                  DD
·148 POKEV+39,3:POKEV+40,10:POKEV+41,13:P
 OKEV+42,13:POKEV+43,13:POKEV+44,13         PB
·150 POKEV+45,7:POKEV+46,1                  DG
·152 POKE2040,192:POKE2041,192:POKE2042,1
 96:POKE2043,196                            CD
·154 POKE2044,197:POKE2045,197:POKE2046,1
 98:POKE2047,199                            MK
·155 POKEV+29,60:POKEV+23,60                GK
·156 POKEV+0,40:POKEV+1,154:POKEV+2,50:PO
 KEV+3,220                                  LJ
·158 POKEV+4,40:POKEV+5,82:POKEV+6,200:PO
 KEV+7,82                                   ON
·160 POKEV+8,46:POKEV+9,196:POKEV+10,230:
 POKEV+11,196                               MI
·162 POKEV+14,246:POKEV+15,161              PG
·164 POKEV+27,63:POKEV+21,191               MO
·166 POKE50433,2:POKE50434,254:POKE50435,
 1:POKE50436,3                              MH
·168 POKE50437,4:POKE50438,0:POKE50439,4:
 POKE50440,0                                DI
·170 POKE50441,4:POKE50442,0:POKE50443,4:
 POKE50444,0                                JF
·172 POKE50445,0:POKE50446,0:POKE50447,0:
 POKE50448,0                                CF
·175 PRINT"[HOME][3"[DOWN]"][WHITE] "SC"[
 5" "]"SH:PRINT"[HOME][3"[DOWN]"]"TAB(33)
 M                                          MI
·176 FORL=54272TO54295:POKEL,0:NEXT         KD
·177 POKE54287,15:POKE54284,160:POKE54285
 ,252                                       CL
·178 POKE54280,80:POKE54279,40:POKE54283,
 129                                        DF
·180 W1=PEEK(V+30):W2=PEEK(V+31)            OE
·190 POKE50432,255:SYS51104                 HG
·199 REM    MAIN LOOP                       PK
·200 JY=PEEK(56321)AND15                    HM
·204 IFJY=13THENPOKE50448,1:POKE50688,128   NJ
·208 IFJY=14THENPOKE50448,255:POKE50688,1
 28                                         FG
```

```
·210 FB=-((PEEK(56321)AND16)=0):IFFB=1THE
N300                                      KE
·211 SYS49152                             KF
·212 W1=PEEK(V+30):IFW1>128THEN350        JO
·214 W2=PEEK(V+31):IFW2>127THEN350        OC
·215 IF SC>2500THENSYS49152               PG
·216 SC=SC+1:PRINT"[HOME][3"[DOWN]"] "SC  PL
·218 POKE50448,0:POKE50688,128            EE
·219 IFSC>500THENSYS49152                 KL
·220 GOTO200                              BO
·300 REM    FIRE                          MH
·304 X=PEEK(V+14)-20:Y=PEEK(V+15)         LB
·306 POKEV+12,X:POKEV+13,Y:POKEV+21,255   EI
·307 POKE50445,255:POKE50688,64:POKE50432
,64                                       EA
·310 C=PEEK(V+12):IFC<32THEN320           OE
·311 W1=PEEK(V+30):IFPEEK(V+30)>64THEN330 AP
·312 GOTO310                              BM
·320 POKE50445,0:POKE50688,64:POKE50432,2
55:POKEV+21,191                           IM
·322 M=M+1:PRINT"[HOME][3"[DOWN]"]"TAB(33
)M:IFM>2THEN500                           LP
·323 GOTO200                              BO
·330 REM    HIT CAVE GLOB                 MI
·331 Q=192                                JN
·332 POKEV+21,191:POKE50445,0:POKE50688,6
4                                         OH
·334 FORX=54272TO54295:POKEX,0:NEXT:POKE5
4296,15                                   MH
·336 POKE54277,8:POKE54278,255:POKE54276,
23:F1=202                                 JB
·338 FORZ=1TO16:F2=30:Q=Q+1:IFQ=196THENQ=
192                                       BE
·339 POKE2040,Q:POKE2041,Q                BO
·340 POKE54273,F1:FORY=1TO10:POKE54287,F2
:F2=F2*1.01:NEXTY:F1=F1-8:NEXTZ           CL
·344 SC=SC+250:PRINT"[HOME][3"[DOWN]"][WH
ITE] "SC                                  GD
·346 FORX=54272TO54295:POKEX,0:NEXT       JL
·347 POKE54287,15:POKE54284,160:POKE54285
,252                                      CL
·348 POKE54280,80:POKE54279,40:POKE54283,
129                                       DF
·349 POKEV+1,52:POKEV+3,220:W1=PEEK(V+30)
:POKE50432,255:GOTO200                    FM
·350 REM    CAVE CRUISER HIT              OP
·351 POKE50432,0                          AG
·352 FORX=54272TO54295:POKEX,0:NEXT:POKE5
4296,15:POKE54277,8:POKE54278,255         LK
·354 POKE54276,85:F1=100:F2=230           EO
·356 FORZ=1TO77:POKE54272,F1:POKE54287,F2 MG
·358 F2=F2-2:F1=F1*.99:NEXT               GE
·360 FORX=54272TO54295:POKEX,0:NEXT       JL
·362 POKE54287,15:POKE54284,160:POKE54285
,252                                      CL
·363 POKE2047,200                         CI
·364 POKE54280,80:POKE54279,40:POKE54283,
129:FORT=0TO1000:NEXT                     GD
·366 FORX=54272TO54295:POKEX,0:NEXT       JL
·367 SH=SH-1:IFSH=0THEN500                DO
·368 POKEV+21,63:FORT=0TO500:NEXT:POKEV+2
1,0:POKEV+16,0:GOTO100                    GC
·500 REM    GAME OVER-REPLAY              OM
·501 FORL=54272TO54295:POKEL,0:NEXT       KD
·502 PRINT"[CLEAR][CYAN]":POKEV+21,0      KN
·503 IFSC>HS THEN HS=SC                   AE
·504 IFM=3THENPRINT"[4"[DOWN]"]"TAB(8)"GA
ME OVER[4"-"]YOU MISSED 3 SHOTS":GOTO510  FA
·505 PRINT"[4"[DOWN]"]"TAB(8)"GAME OVER[4
"-"]YOU LOST 3 SHIPS"                     OI
·510 PRINT"[6"[DOWN]"]"TAB(12)"S C O R E
";SC                                      KH
·512 PRINT"[DOWN]"TAB(12)"HIGH SCORE  ";H
S                                         HL
```

MAKING HEADLINES FROM PAGE 92

Use of an assembler required for entry!

BIGCHRS

```
*
* BIGCHR
*
         ORG     $8000
*
COLOR    EQU     $10
COLMAP   EQU     $8400
BASE     EQU     $A000
VICTRL   EQU     $D011
CI2PRA   EQU     $DD00
CIADIR   EQU     $DD02
VICMEM   EQU     $D018
*
HMAX     EQU     320
HMID     EQU     160-4
VMID     EQU     100-4
*
SCRLEN   EQU     8000
MAPLEN   EQU     1000
*
TEMPA    EQU     $FB
TEMPB    EQU     TEMPA+2
*
TABPTR   EQU     TEMPA
TABSIZ   EQU     $02A7
*
HPSN     EQU     TABSIZ+2
VPSN     EQU     HPSN+2
CHAR     EQU     VPSN+1
ROW      EQU     CHAR+1
LINE     EQU     ROW+1
BYTE     EQU     LINE+1
BITT     EQU     BYTE+2
*
MPRL     EQU     BITT+1
MPRH     EQU     MPRL+1
MPDL     EQU     MPRH+1
MPDH     EQU     MPDL+1
PRODL    EQU     MPDH+1
PRODH    EQU     PRODL+1
*
FILVAL   EQU     PRODH+1
*
R6510    EQU     $0001
NEWADR   EQU     $8800
CHRBAS   EQU     $D000
CIACRE   EQU     $DC0E
*
TABLEN   EQU     $800
*
MVSRCE   EQU     $61
MVDEST   EQU     MVSRCE+2
BYTPTR   EQU     MVDEST+2
*
LENPTR   EQU     $9000
CHCODE   EQU     LENPTR+2
HPTR     EQU     CHCODE+2
```

IMPORTANT! Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 105 and 106 explain these codes and provide other essential information on entering ***Ahoy!*** programs. Refer to these pages **before** entering any programs!

```
ONEBYT   EQU   HPTR+1
COUNT    EQU   ONEBYT+2
*
         JMP   START
*
* BLOCK FILL ROUTINE
*
BLKFIL   LDA   FILVAL
         LDX   TABSIZ+1
         BEQ   PARTPG
         LDY   #0
FULLPG   STA   (TABPTR),Y
         INY
         BNE   FULLPG
         INC   TABPTR+1
         DEX
         BNE   FULLPG
PARTPG   LDX   TABSIZ
         BEQ   FINI
         LDY   #0
PARTLP   STA   (TABPTR),Y
         INY
         DEX
         BNE   PARTLP
FINI     RTS
*
* 16-BIT MULTIPLICATION
* ROUTINE
*
MULT16   LDA   #0
         STA   PRODL
         STA   PRODH
         LDX   #17
         CLC
MULT     ROR   PRODH
         ROR   PRODL
         ROR   MPRH
         ROR   MPRL
         BCC   CTDOWN
         CLC
         LDA   MPDL
         ADC   PRODL
         STA   PRODL
         LDA   MPDH
         ADC   PRODH
         STA   PRODH
CTDOWN   DEX
         BNE   MULT
         RTS
*
* PLOT ROUTINE
*
* ROW=VPSN/8
* (8-BIT DIVIDE)
*
PLOT     LDA   VPSN
         LSR   A
         LSR   A
         LSR   A
         STA   ROW
*
* CHAR=HPSN/8
* (16-BIT DIVIDE)
*
         LDA   HPSN
         STA   TEMPA
         LDA   HPSN+1
         STA   TEMPA+1
         LDX   #3
DLOOP    LSR   TEMPA+1
         ROR   TEMPA
         DEX
         BNE   DLOOP
         LDA   TEMPA
         STA   CHAR
*
* LINE=VPSN AND 7
*
         LDA   VPSN
         AND   #7
         STA   LINE
*
* BITT=7-(HPSN AND 7)
*
         LDA   HPSN
         AND   #7
         STA   BITT
         SEC
         LDA   #7
         SBC   BITT
         STA   BITT
*
* BYTE=BASE+ROW*HMAX
* +8*CHAR+LINE
*
* FIRST MULTIPLY
* ROW * HMAX
*
         LDA   ROW
         STA   MPRL
         LDA   #0
         STA   MPRH
         LDA   #<HMAX
         STA   MPDL
         LDA   #>HMAX
         STA   MPDH
         JSR   MULT16
         LDA   MPRL
         STA   TEMPA
         LDA   MPRL+1
         STA   TEMPA+1
*
* ADD PRODUCT TO BASE
*
         CLC
         LDA   #<BASE
         ADC   TEMPA
         STA   TEMPA
         LDA   #>BASE
         ADC   TEMPA+1
         STA   TEMPA+1
*
* MULTIPLY 8 * CHAR
*
         LDA   #8
         STA   MPRL
         LDA   #0
         STA   MPRH
         LDA   CHAR
         STA   MPDL
         LDA   #0
         STA   MPDH
         JSR   MULT16
         LDA   MPRL
         STA   TEMPB
         LDA   MPRH
         STA   TEMPB+1
*
* ADD LINE
*
         CLC
         LDA   TEMPB
         ADC   LINE
         STA   TEMPB
         LDA   TEMPB+1
         ADC   #0
         STA   TEMPB+1
*
* TEMPA + TEMPB = BYTE
*
         CLC
         LDA   TEMPA
         ADC   TEMPB
         STA   TEMPB
         LDA   TEMPA+1
         ADC   TEMPB+1
         STA   TEMPB+1
*
* POKE BYTE,PEEK(BYTE)
* OR2^BIT
*
         LDX   BITT
         INX
         LDA   #0
         SEC
SQUARE   ROL
         DEX
         BNE   SQUARE
         LDY   #0
         ORA   (TEMPB),Y
         STA   (TEMPB),Y
         RTS
*
* CALCULATE CHCODE'S
```

```
* ADDRESS
*
GETADR  LDA   #0
        STA   CHCODE+1
        LDA   CHCODE
        CLC
        ASL   A
        ROL   CHCODE+1
        ASL   A
        ROL   CHCODE+1
        ASL   A
        ROL   CHCODE+1
        STA   CHCODE
*
        CLC
        LDA   CHCODE
        ADC   #<NEWADR
        STA   BYTPTR
        LDA   CHCODE+1
        ADC   #>NEWADR
        STA   BYTPTR+1
        RTS
*
* MAIN ROUTINE STARTS
* HERE
*
START   LDA   VICMEM
        ORA   #8
        STA   VICMEM
*
        LDA   VICTRL
        ORA   #32
        STA   VICTRL
*
* USE BANK 2
*
        LDA   CIADIR
        ORA   #3
        STA   CIADIR
*
        LDA   CI2PRA
        AND   #252
        ORA   #1
        STA   CI2PRA
*
* CLEAR BIT MAP
*
        LDA   #0
        STA   FILVAL
        LDA   #<BASE
        STA   TABPTR
        LDA   #>BASE
        STA   TABPTR+1
        LDA   #<SCRLEN
        STA   TABSIZ
        LDA   #>SCRLEN
        STA   TABSIZ+1
        JSR   BLKFIL
*
* SET BKG AND LINE
* COLORS
*
        LDA   #COLOR
        STA   FILVAL
        LDA   #<COLMAP
        STA   TABPTR
        LDA   #>COLMAP
        STA   TABPTR+1
        LDA   #<MAPLEN
        STA   TABSIZ
        LDA   #>MAPLEN
        STA   TABSIZ+1
        JSR   BLKFIL
*
* TURN OFF KB INTERRUPT
* TIMER
*
MVCHRS  LDA   CIACRE
        AND   #$FE
        STA   CIACRE
*
* SWITCH BASIC OUT
*
        LDA   R6510
        AND   #$FE
        STA   R6510
*
* SWITCH I/O OFF,
* CHAR ROM ON
*
        LDA   R6510
        AND   #$FB
        STA   R6510
*
* COPY CHARACTERS
* INTO RAM
*
        LDA   #<CHRBAS
        STA   MVSRCE
        LDA   #>CHRBAS
        STA   MVSRCE+1
*
        LDA   #<NEWADR
        STA   MVDEST
        LDA   #>NEWADR
        STA   MVDEST+1
*
        LDA   #<TABLEN
        STA   LENPTR
        LDA   #>TABLEN
        STA   LENPTR+1
*
* START MOVE
*
        LDY   #0
        LDX   LENPTR+1
        BEQ   MVPART
MVPAGE  LDA   (MVSRCE),Y
        STA   (MVDEST),Y
        INY
        BNE   MVPAGE
        INC   MVSRCE+1
        INC   MVDEST+1
        DEX
        BNE   MVPAGE
MVPART  LDX   LENPTR
        BEQ   MVEXIT
MVLAST  LDA   (MVSRCE),Y
        STA   (MVDEST),Y
        INY
        DEX
        BNE   MVLAST
MVEXIT
*
* SWITCH I/O BACK IN
*
        LDA   R6510
        ORA   #4
        STA   R6510
*
* TURN TIMER BACK ON
*
        LDA   CIACRE
        ORA   #1
        STA   CIACRE
*
* DRAW A CHARACTER
*
        LDA   #<HMID
        STA   HPSN
        STA   HPTR
        LDA   #>HMID
        STA   HPSN+1
        STA   HPTR+1
        LDA   #VMID
        STA   VPSN
*
        LDA   #1
        STA   CHCODE
        JSR   GETADR
*
* A NESTED LOOP:
*
* X IS THE OUTSIDE
* LOOP
*
        LDX   #8
*
* SET UP COUNTER FOR
* 2 VERT LINES
*
SETLIN  LDA   #2
        STA   COUNT
*
```

IMPORTANT! Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 105 and 106 explain these codes and provide other essential information on entering *Ahoy!* programs. Refer to these pages **before** entering any programs!

```
DRAWLN   LDY   #0
         LDA   (BYTPTR),Y
         STA   ONEBYT
*
* THE INSIDE LOOP:
*
* (Y IS ZERO AT START)
*
RSHIFT   LDA   ONEBYT
         ASL   A
         STA   ONEBYT
         BCS   SHOW
*
         INC   HPSN
         BNE   ITSOK
         INC   HPSN+1
ITSOK    JMP   NOSHOW
*
* DISPLAY BIT
*
* SAVE X AND Y
* REGISTERS
*
SHOW     TXA
         PHA
         TYA
         PHA
*
         JSR   PLOT
*
* NOW DO IT AGAIN
*
         INC   HPSN
         BNE   NOINC
         INC   HPSN+1
*
NOINC    JSR   PLOT
*
* RETRIEVE X AND Y
* REGISTERS
*
         PLA
         TAY
         PLA
         TAX
*
NOSHOW   INC   HPSN
         BNE   LEAP
         INC   HPSN+1
*
LEAP     INY
         CPY   #8
         BCC   RSHIFT
*
         INC   VPSN
*
         LDA   HPTR
         STA   HPSN
         LDA   HPTR+1
         STA   HPSN+1
*
* 2 VERT LINES
* DONE YET?
         DEC   COUNT
         BNE   DRAWLN
*
         INC   BYTPTR
         BNE   OKMSB
         INC   BYTPTR+1
OKMSB    DEX
         BNE   SETLIN
*
INF      JMP   INF
*
         END
*
```

1040A CALCULATOR

FROM PAGE 97

```
•10 PRINT"FORM 1040A CALCULATOR"              EO
•20 PRINT"COPYRIGHT 1986 CHERYL PETERSON"     IA
•30 PRINT"PRINT AN INSTRUCTION LIST FOR F
ILLING OUT 1040A WHEN FINISHED?"              ID
•40 INPUT"[RVSON]Y[RVSOFF]ES OR [RVSON]N[
RVSOFF]O";Q$                                  DD
•45 IF Q$<>"Y"THEN90                          DO
•50 INPUT"TO [RVSON]S[RVSOFF]CREEN OR [RV
SON]P[RVSOFF]RINTER";Q2$                      DL
•90 REM INPUT STATEMENTS                      BM
•100 INPUT"HOW MANY EXEMPTIONS ARE YOU CL
AIMING";X                                     LF
•200 INPUT"INCOME FROM W-2 FORMS";W           EO
•300 INPUT"INTEREST COLLECTED THIS YEAR";
I                                             EC
•400 INPUT"DIVIDENDS COLLECTED THIS YEAR"
;D                                            LL
•500 INPUT"EXCLUSIONS";E                      HP
•600 INPUT"TAXABLE UNEMPLOYMENT COMPENSAT
ION";U                                        CN
•700 INPUT"CONTRIBUTIONS TO POLITICIANS T
HIS YEAR";P                                   FD
•800 INPUT"FEDERAL INCOME TAX WITHHELD";F     NG
•900 INPUT"EARNED INCOME CREDIT";C            OM
•1100 GOSUB 2100                              FE
•1140 PRINT"[CLEAR]"                          HH
•1150 PRINT"ENTER ";GI;"ON LINE 10 OF THE
 TAX FORM."                                   KJ
•1160 PRINT"ENTER ";X2;"ON LINE 11 OF THE
 TAX FORM."                                   PK
•1170 PRINT"ENTER ";TN;"ON LINE 12 OF THE
 TAX FORM."                                   CL
•1200 PRINT"LOOK UP THE AMOUNT OF TAXES D
UE"                                           NA
•1210 PRINT"ON $";TN;"IN THE TAX TABLES."     IP
•1300 INPUT"TAXES DUE ACCORDING TO TABLE"
;TD                                           NE
•1400 INPUT"ADVANCED EARNED INCOME CREDIT
";A                                           PJ
•1500 GOSUB 2600                              FB
•1550 PRINT"[CLEAR]"                          HH
•1560 IF Q2$<>"P"AND Q$<>"N"THEN GOSUB 19
30                                            II
•1570 IF Q2$="P" THEN GOSUB 1921              IJ
•1600 IF TP>TT THEN R=TP-TT                   BE
•1650 IF TP=TT THEN 1800                      AC
•1660 IF TP<TT THEN 1900                      AA
•1700 PRINT"YOUR TOTAL REFUND IS $";R         PC
•1710 PRINT"ENTER THIS AMOUNT ON LINE 17.
"                                             IE
•1797 IF CL<>1 THEN 1799                      BJ
•1798 PRINT#4:CLOSE4                          OA
•1799 END                                     IC
•1800 PRINT"YOU SEEM TO HAVE COME OUT EVE
```

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```
N."                                           KJ
·1810 PRINT"ENTER 0 ON LINES 17 AND 18."      HF
·1897 IF CL<>1 THEN 1799                      BJ
·1898 PRINT#4:CLOSE4                          OA
·1899 END                                     IC
·1900 R=TT-TP                                 PG
·1910 PRINT"YOU OWE THE GOVERNMENT $";R       HG
·1915 PRINT"ENTER THIS AMOUNT ON LINE 18.
"                                             IF
·1917 IF CL<>1 THEN 1799                      BJ
·1918 PRINT#4:CLOSE4                          OA
·1920 END                                     IC
·1921 IF Q$<>"Y"THEN RETURN                   FG
·1922 OPEN4,4:CMD4                            EL
·1930 PRINT"FILL OUT QUESTIONS 1-5 AS APP
ROPRIATE."                                    EM
·1931 PRINT"ENTER";X;"IN BOX NUMBER 6."       MN
·1932 PRINT"ENTER";W;"IN BOX NUMBER 7."       ON
·1940 PRINT"ENTER";I;"IN BOX NUMBER 8A."      HP
·1941 PRINT"ENTER";D;"IN BOX NUMBER 8B."      EB
·1942 PRINT"ENTER";Z;"IN BOX NUMBER 8C."      LM
·1943 PRINT"ENTER";E;"IN BOX NUMBER 8D."      NK
·1944 PRINT"ENTER";Y;"IN BOX NUMBER 8E."      BD
·1955 PRINT"ENTER";GI;"IN BOX NUMBER 10."     CH
·1960 PRINT"ENTER";X2;"IN BOX NUMBER 11."     MK
·1965 PRINT"ENTER";TN;"IN BOX NUMBER 12."     IP
·1970 PRINT"ENTER";P;"IN BOX NUMBER 13A."     ON
·1971 PRINT"ENTER";F;"IN BOX NUMBER 13B."     OI
·1972 PRINT"ENTER";C;"IN BOX NUMBER 13C."     GA
·1975 PRINT"ENTER";TP;"IN BOX NUMBER 14."     BH
·1980 PRINT"ENTER";TD;"IN BOX NUMBER 15A.
"                                             GJ
·1985 PRINT"ENTER";A;"IN BOX NUMBER 15B."     AD
·1990 PRINT"ENTER";TT;"IN BOX NUMBER 16."     ON
·1997 IF Q2$="P" THEN CL=1                    HF
·1998 RETURN                                  IM
·1999 END                                     IC
·2000 REM COMPUTATIONS                        FP
·2100 Z=I+D:Y=Z-E:IF Y<0 THEN Y=0             FO
·2200 GI=W+Y+U                                JG
·2300 X2=1000*X                               BB
·2400 TN=GI-X2                                BG
·2500 TP=P+F+C                                JK
·2550 RETURN                                  IM
·2600 TT=TD+A                                 PO
·2700 RETURN                                  IM
```

JCALC

FROM PAGE 28

ML SUBROUTINE BUILDER

```
·0 REM---THIS IS WHERE THE MACHINE LANGUA
GE WILL BE                                    HD
·10 SB=PEEK(43)+256*PEEK(44):L1=SB+5:L2=L
1+43                                          HL
·20 FORI=L1TOL2:READA:POKEI,A:CK=CK+A:NEX
TI                                            KH
·30 IFCK<>4670THENPRINT"ERROR IN DATA STA
TEMENTS -- CHECK YOUR PROGRAM":END            IN
·40 PRINT"DATA ENTERED CORRECTLY -- DELET
E ANY LINE BUT 0 AND CONTINUE ENTERING J
CALC"                                         OC
·50 DATA165,122,141,112,3,165,123,141,113
,3,165,10,133,122,169,2,133,123,32,121        JF
·60 DATA165,165,10,133,122,169,2,133,123,
32,165,169,173,112,3,133,122,173,113,3        BC
·70 DATA133,123,96,0                          ND
```

BASIC PORTION

```
·1 PRINTCHR$(8);CHR$(14):GOTO1000             DP
·5 POKE54276,17:FORTT=1TO50:NEXT:POKE5427
6,16:RETURN                                   BP
·10 IFCC>BCTHENBC=CC                          LA
·12 IFCR>BRTHENBR=CR                          PM
·14 RETURN                                    IM
·16 PRINTCH$;A$;"[c @]";:T$=A$                DP
·18 GETB$:IFB$=""THEN18                       DA
·20 IF(B$=CHR$(20))AND(LEN(T$)>1)THENT$=L
EFT$(T$,LEN(T$)-1):PRINTB$;"[LEFT]";"[c
@]";:GOTO18                                   HM
·24 IFB$="[HOME]"THEN16                       AH
·26 IFB$=CHR$(13)THENRETURN                   EH
·28 PRINT"[LEFT]"B$"[c @]";:T$=T$+B$:ON-(
LEN(T$)>=SL)GOSUB5:GOTO18                     AD
·30 IFT$=""THENGOSUB5:RETURN                  CD
·32 C=ASC(T$)-65:R=VAL(MID$(T$,2))-1:RETU
RN                                            ME
·34 HC=CC:HR=CR:RETURN                        LI
·36 CC=HC:CR=HR:RETURN                        JA
·38 PRINTCH$;:A$="RANGE?":GOSUB16:T$=MID$
(T$,7)                                        GF
·39 IFT$=""THENR1=CR:R2=CR:C1=CC:C2=CC:RE
TURN                                          FL
·40 GOSUB30:R1=R:C1=C                         HK
·42 FORII=1TOLEN(T$):II$=MID$(T$,II,1):IF
II$=":"THEN46                                 EI
·43 IFII$=")"THEN48                           HM
·44 NEXT:GOTO48                               LH
·46 T$=MID$(T$,II+1):GOSUB30                  HC
·48 R2=R:C2=C:RETURN                          PF
·50 PRINTCH$" ";:POKELL,2*W                   NP
·51 IFV$(CC,CR)="#"THENPRINTV(CC,CR)"[HOM
E]";:INPUTV(CC,CR):GOTO68                     HP
·52 PRINT" "Q$;V$(CC,CR);Q$"[HOME]";:INPU
TV$(CC,CR):GOSUB900:GOTO68                    KA
·54 PRINT"[CLEAR][RVSON]WAIT[RVSOFF]":GOS
UB890:GOSUB76:GOSUB68:GOTO84                  LJ
·56 IFCA>0THENFORI=CATOCA+CW-1:POKEI,PEEK
(I)AND127:NEXT                                HO
·58 GOSUB84:GOTO68                            CN
·62 T$=V$(CC,CR):IFT$=""THENT$=BL$:RETURN     HJ
```

```
·64 IFASC(T$)=39THENT$=LEFT$(MID$(T$,2)+B
L$,CW):RETURN                              OE
·66 T$=RIGHT$(BL$+STR$(INT(100*V(CC,CR)+.
5)/100),CW):RETURN                         BO
·68 GOSUB62:POKE782,3+(CC-LC)*CW:POKE781,
4+CR-TR:POKE783,0:SYS65520                 NI
·70 PRINT"[RVSON]"T$"[RVSOFF]"CH$;V$(CC,C
R);:IFV$(CC,CR)="#"THENPRINTV(CC,CR);      CO
·72 PRINT"[HOME]";:RETURN                  OF
·76 PRINT"[CLEAR]":PRINT:PRINT:GOSUB34     FF
·78 PRINT"[RVSON]"SPC(7);CHR$(LC+65);:FOR
I=LC+1TOLC+NC:PRINTSPC(CW);CHR$(I+65);:N
EXT:PRINT"[RVSOFF]"                        JN
·80 FORCR=TRTOTR+NR:PRINT"[RVSON]"RIGHT$(
BL$+STR$(CR+1),3)"[RVSOFF]";               FD
·82 FORCC=LCTOLC+NC:GOSUB62:PRINTT$;:NEXT
:PRINT:NEXT:CA=0:GOSUB36:RETURN            BK
·84 CA=SO+3+W*(4+CR-TR)+CW*(CC-LC):RETURN FJ
·86 PRINTCH$;:INPUT"DEVICE#";D:IFD=0THEN1
100                                        DF
·87 IFD<>1ANDD<>8THENOPENDI,D,7:RETURN     DO
·88 PRINTCH$;:INPUT"FILENAME";F$:SA=-(DI=
1):IFD=8THENSA=4                           PG
·90 IFD=8ANDDI=1THENF$="@0:"+F$+",S,W"     GG
·92 IFD=8ANDDI=2THENF$=F$+",S,R"           ND
·94 OPENDI,D,SA,F$:GOTO68                  HK
·96 DI=1:GOSUB86:PRINT#1,BR","BC:FORI=0TO
BR                                         HM
·97 FORJ=0TOBC:PRINT#1,V(J,I)","Q$;V$(J,I
);Q$:NEXTJ,I                               DA
·98 CLOSE1:RETURN                          JG
·108 DI=2:GOSUB86:INPUT#2,BR,BC            BH
·110 FORI=0TOBR:FORJ=0TOBC:INPUT#2,V(J,I)
,V$(J,I):NEXTJ,I                           LB
·112 CLOSE2:GOSUB76:GOSUB68:RETURN         PC
·120 DI=2:GOSUB86:GOSUB34:GOSUB38:GOSUB90
0                                          FI
·122 FORCR=R1TOR2:FORCC=C1TOC2:GOSUB62:PR
INT#2,T$;:NEXT:PRINT#2:NEXT                PB
·124 CLOSE2:GOSUB36:RETURN                 MD
·126 GOSUB34:GOSUB38:FORCR=R1TOR2:FORCC=C
1TOC2:V$(CC,CR)="":V(CC,CR)=0:NEXTCC,CR    PE
·128 GOSUB36:GOSUB76:GOSUB68:RETURN        FH
·130 A$="FROM?":GOSUB16:T$=MID$(T$,6):GOS
UB39:RS=R1:CS=C1                           LI
·132 A$="TO?":GOSUB16:T$=MID$(T$,4):GOSUB
39:TR$=LEFT$(TR$,1)                        IC
·134 FORC=C2TOC1STEP-1:FORR=R2TOR1STEP-1:
V$(C,R)=V$(CS,RS):V(C,R)=V(CS,RS):NEXTR,
C                                          BE
·136 GOTO54                                PP
·140 A$="QUITTING -- ARE YOU[3" "]SURE?":
GOSUB16:T$=MID$(T$,28,1)                   HN
·142 IFT$="[s Y]"ORT$="Y"THENPRINT"[CLEAR
]":END                                     OC
·144 GOSUB68:RETURN                        MP
·800 CM$=LEFT$(T$,3):T$=MID$(T$,5):GOSUB4
0                                          MB
·802 SU=0:AV=0:MA=-1E20:MI=1E20:K=0        ML
·804 FORII=R1TOR2:FORJJ=C1TOC2:IFV$(JJ,II
)=""THEN812                                PK
·806 IFASC(V$(JJ,II))=39THEN812            BG
·808 V=V(JJ,II):SU=SU+V:K=K+1:IFMA<VTHENM
A=V                                        OO
·810 IFMI>VTHENMI=V                        GJ
·812 NEXTJJ,II:IFK<>0THENAV=SU/K           EJ
·814 V=-(CM$="SUM")*SU-(CM$="AVG")*AV-(CM
$="MAX")*MA-(CM$="MIN")*MI:F$=STR$(V)      OP
·816 I=I+1:N$=MID$(OL$,I,1):IFI>=OLTHEN92
2                                          EJ
·818 IFN$<>")"THEN816                      CN
·820 I=I+1:N$=MID$(OL$,I,1):N=0:IFN$<>""T
HENN=ASC(N$)                               EB
·822 GOTO910                               CK
·890 GOSUB34:FORCR=0TOBR:FORCC=0TOBC:GOSU
B900                                       GE
·892 GOSUB84:NEXTCC,CR:GOSUB36:RETURN      OF
·900 IFV$(CC,CR)=""THENRETURN              OB
·901 IFASC(V$(CC,CR))<>61THENRETURN        NN
·902 B$="V("+STR$(CC)+","+STR$(CR)+")"     LJ
·904 OL$=V$(CC,CR):OL=LEN(OL$)             MA
·906 F$=LEFT$(OL$,1):F=ASC(F$):I=2         FC
·908 N$=MID$(OL$,I,1):N=ASC(N$):IF(F>64AN
DF<91)AND(N>47ANDN<58)THEN914              HK
·909 IFF$="@"THENT$=MID$(OL$,I):GOTO800    KJ
·910 B$=B$+F$:F$=N$:F=N:I=I+1:IFI>OLTHENB
$=B$+F$:GOTO924                            GP
·912 GOTO908                               DF
·914 C=F-65:R=VAL(MID$(OL$,I))-1:F$="V("+
STR$(C)+","+STR$(R)+")":B$=B$+F$           AE
·916 I=I+1:IFI>OLTHEN924                   NE
·918 F$=MID$(OL$,I,1):F=ASC(F$):IF(F>47AN
DF<58)THEN916                              HF
·920 IFI<OLTHENI=I+1:GOTO908               HN
·922 B$=B$+F$                              JD
·924 XX=512:FORI=1TOLEN(B$):F$=MID$(B$,I,
1):F=ASC(F$):IFF<>32THENPOKEXX,F:XX=XX+1 AD
·926 NEXTI:POKEXX,0:SYSCL:RETURN           MD
·1000 W=40:NC=3:NR=17:MC=15:MR=30:SO=1024
:LC=0:TR=0:CW=9:LL=213:POKE36876,200:POK
E10,0                                      KH
·1002 DIMV(MC,MR),V$(MC,MR):GOSUB76:BL$="
":FORI=1TO2*W:BL$=BL$+" ":NEXT:CH$="[HOM
E]"+BL$+"[HOME]"                           GK
·1004 BL$=LEFT$(BL$,CW):GOSUB84:Q$=CHR$(3
4):POKE54273,68:POKE54272,149:POKE54277,
64                                         KF
·1005 POKE54278,128:POKE54296,15           OM
·1006 FORI=1TOW+1:CR$=CR$+"[RIGHT]":CD$=C
D$+"[DOWN]":NEXT                           BH
·1010 REM PLACE FUNCTION DEF. HERE         KF
·1090 GOSUB68:PL=65520:CL=PEEK(43)+5+PEEK
(44)*256                                   OB
·1100 GETA$:IFA$=""THEN1100                KA
·1102 A=ASC(A$):IF(A>132ANDA<141)THENONA-
132GOSUB54,50,126,130,96,108,120,140       NK
```

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```
•1104 IFA$<>"[UP]"THEN1112                   KB
•1106 IFCR=0THEN1172                         JK
•1108 CR=CR-1:IFCR<TRTHENTR=TR-1:GOSUB76     NC
•1110 GOTO1134                               FE
•1112 IFA$<>"[DOWN]"THEN1120                 CB
•1114 IFCR=MRTHEN1172                        PI
•1116 CR=CR+1:IFCR>TR+NRTHENTR=TR+1:GOSUB
 76                                          GI
•1118 GOTO1134                               FE
•1120 IFA$<>"[LEFT]"THEN1128                 JO
•1122 IFCC=0THEN1172                         GF
•1124 CC=CC-1:IFCC<LCTHENLC=LC-1:GOSUB76     JG
•1126 GOTO1134                               FE
•1128 IFA$<>"[RIGHT]"THEN1136                DG
•1130 IFCC=MCTHEN1172                        MO
•1132 CC=CC+1:IFCC>LC+NCTHENLC=LC+1:GOSUB
 76                                          AB
•1134 GOSUB56:GOTO1100                       IP
•1136 IFA$<>"'"THEN1142                      DE
•1138 SL=CW:GOSUB16                          BP
•1140 V$(CC,CR)=T$:GOTO1154                  KE
•1142 IFA$<>"="THEN1148                      DM
•1144 SL=2*W:GOSUB16                         MC
•1146 V$(CC,CR)=T$:GOTO1154                  KE
•1148 IF(A$<"0"ORA$>"9")ANDA$<>"-"THEN116
 0                                           DB
•1150 SL=W:GOSUB16                           OH
•1152 V$(CC,CR)="#":V(CC,CR)=VAL(T$)         GA
•1154 GOSUB10:GOSUB900:GOSUB68:GOTO1100      AK
•1160 IFA$<>">"THEN1168                      ED
•1162 SL=W:A$="GOTO?":GOSUB16:T$=MID$(T$,
 6):GOSUB30:CC=C:CR=R                        JF
•1163 IF(CC>(LC+NC))OR(CR>(TR+NR))THENLC=
 CC:TR=CR                                    GL
•1164 IFTR>(MR-NR)THENTR=MR-NR               PN
•1165 IFLC>(MC-NC)THENLC=MC-NC               PL
•1166 GOSUB76:GOSUB68:GOTO1100               MA
•1168 IFA$<>"[HOME]"THEN1172                 BE
•1170 CC=0:CR=0:LC=0:TR=0:GOSUB76:GOSUB68
 :GOSUB84:GOTO1100                           CB
•1172 GOSUB5:GOTO1100                        FG
```

SCREEN WINDOW
FROM PAGE 54

```
•10 S=49152:E=49940                          CO
•11 POKE 53281,0:POKE 53280,0                ED
•15 PRINT"[CLEAR][4"[DOWN]"] [YELLOW][RVS
 ON]PATIENCE IS A VIRTUE[4"."]"              BH
•20 FORI=STOE:READ A:POKE I,A:NEXT           DA
•30 PRINT"[HOME]SYS ";S;" :REM [4"*"] STA
 RT IT UP [4"*"]"                            JN
•90 END                                      IC
•1000 DATA 120,173,21,3,201,192,240,35,14
 1,164,194,173,20,3,141,163                  DL
•1001 DATA 194,169,192,141,21,3,169,45,14
 1,20,3,169,0,141,165,194                    HG
•1002 DATA 141,168,194,169,255,141,166,19
 4,141,167,194,88,96,173,165,194             JN
•1003 DATA 208,21,169,1,141,165,194,169,1
 92,72,169,80,72,8,72,72                     MB
•1004 DATA 72,108,163,194,78,165,194,173,
 13,220,104,168,104,170,104,64               AE
•1005 DATA 165,198,240,240,173,119,2,201,
 17,208,18,165,214,201,24,208                BK
•1006 DATA 227,32,149,192,32,174,192,32,5
 9,193,76,68,192,201,145,208                 LC
•1007 DATA 16,165,214,208,207,32,149,192,
 32,203,192,32,50,193,76,68                  CD
•1008 DATA 192,201,133,208,6,32,149,192,7
 6,148,193,201,134,208,181,32                GC
•1009 DATA 149,192,76,195,193,169,1,133,2
 04,165,207,240,12,165,206,174               MJ
•1010 DATA 135,2,160,0,132,207,32,19,234,
 169,0,133,198,96,169,25                     GH
•1011 DATA 133,214,32,33,193,48,18,32,68,
 193,240,246,32,57,194,208                   DM
•1012 DATA 241,32,107,194,240,3,32,122,19
 4,24,96,169,255,133,214,32                  LM
•1013 DATA 15,193,176,57,32,68,193,240,24
 6,32,57,194,208,241,165,97                  FI
•1014 DATA 133,95,165,98,133,96,240,37,16
 9,2,133,99,198,99,48,21                     OJ
•1015 DATA 32,33,193,16,247,169,0,141,165
 ,2,32,129,233,165,217,9                     CD
•1016 DATA 128,133,217,48,231,169,1,141,1
 46,2,32,122,194,24,96,166                   AM
•1017 DATA 214,232,224,25,176,10,181,217,
 16,247,160,0,32,240,255,24                  FH
•1018 DATA 96,166,214,202,48,11,181,217,1
 6,249,24,160,0,32,240,255                   OL
•1019 DATA 74,96,24,162,0,160,0,32,240,25
 5,96,24,162,24,160,0                        BA
•1020 DATA 32,240,255,96,169,0,133,20,133
 ,21,168,192,40,176,61,177                   GG
•1021 DATA 209,200,201,32,240,245,201,48,
 144,50,201,58,176,46,233,47                 KH
•1022 DATA 133,99,165,21,133,100,201,25,1
 76,39,165,20,10,38,100,10                   II
•1023 DATA 38,100,101,20,133,20,165,100,1
 01,21,133,21,6,20,38,21                     BI
•1024 DATA 165,20,101,99,133,20,144,195,2
 30,21,176,191,165,20,5,21                   BC
•1025 DATA 96,169,0,96,78,165,194,32,122,
 166,169,249,160,194,32,30                   PK
•1026 DATA 171,32,96,165,162,0,134,122,32
 ,124,165,162,0,189,0,2                      ED
•1027 DATA 157,168,194,240,3,232,208,245,
 169,43,133,95,169,0,133,96                  IC
```

```
•1028 DATA 76,218,193,78,165,194,32,122,1
 66,173,166,194,133,20,173,167          FB
•1029 DATA 194,133,21,32,57,194,240,2,176
 ,74,32,107,194,240,69,160              GL
•1030 DATA 4,162,0,132,99,189,168,194,240
 ,18,177,95,240,236,221,168             GK
•1031 DATA 194,240,5,164,99,200,208,233,2
 32,200,208,233,169,147,32,210          GH
•1032 DATA 255,162,10,160,0,32,240,255,32
 ,122,194,165,20,141,166,194            BI
•1033 DATA 165,21,141,167,194,32,174,192,
 32,174,192,32,174,192,32,203           BM
•1034 DATA 192,76,51,194,169,6,160,195,32
 ,30,171,169,255,141,166,194            OM
•1035 DATA 141,167,194,78,165,194,108,2,3
 ,169,0,133,97,133,98,165               AI
•1036 DATA 43,133,95,165,44,133,96,165,21
 ,160,3,209,95,144,27,208               HK
•1037 DATA 9,165,20,136,209,95,144,18,240
 ,16,165,95,133,97,165,96               HB
•1038 DATA 133,98,32,107,194,208,224,169,
 1,56,96,160,0,177,95,170               EE
•1039 DATA 200,177,95,134,95,133,96,177,9
 5,96,160,2,177,95,133,20               AE
•1040 DATA 200,177,95,133,21,173,0,3,72,1
 73,1,3,72,169,154,141                  DC
•1041 DATA 0,3,169,194,141,1,3,76,189,166
 ,104,141,1,3,104,141                   DP
•1042 DATA 0,3,96,0,255,255,0,0,255,190,0
 ,0,255,255,0,0                         MH
•1043 DATA 255,255,0,0,255,255,0,0,255,25
 5,0,0,255,255,0,0                      HG
•1044 DATA 255,255,0,0,255,255,0,0,255,25
 5,0,0,255,255,0,0                      HG
•1045 DATA 255,255,0,0,255,255,0,0,255,25
 5,0,0,255,255,0,0                      HG
•1046 DATA 255,255,0,0,255,255,0,0,255,19
 1,0,0,255,255,0,0                      EN
•1047 DATA 255,255,0,0,255,255,0,0,255,19
 ,83,69,65,82,67,72                     EO
•1048 DATA 32,70,79,82,58,0,19,78,79,84,3
 2,70,79,85,78,68                       LG
•1049 DATA 32,32,13,0,255               EK
```

COMET CATCHING
FROM PAGE 18

COMET CATCHER

Note: Comet Catcher must be entered on the C-128 in 128 mode. Therefore *Bug Repellent* line codes cannot be provided.

```
•1 REM =-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=
•2 REM        - COMET CATCHER -
•3 REM        RUPERT REPORT #28
•4 REM =-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=
•5 REM     A REAL-WORLD SIMULATION
•6 REM   OF ASTRONOMICAL PROPORTIONS
•7 REM ===================================
•8 REM  << WRITTEN FOR COMMODORE 128 >>
•9 REM ===================================
•10 GRAPHIC 2,1,22     :REM STANDARD SPLIT
 SCREEN GRAPHICS - TEXT AT LINE 22
•20 COLOR 0,1 : COLOR 1,2  :REM TEXT BACK
 GROUND AND BIT-MAP FOREGROUND
•30 COLOR 5,2              :REM TEXT COLOR
•40 PRINT CHR$(27)"M" :REM NO SCROLL
•50 WINDOW 0,22,39,24 :REM TEXT WINDOW
•60 CIRCLE 1,160,100,1     :REM  DRAW SUN
•70 SD=60*60*24            :REM # SECONDS/DAY
•80 AU=1.496E11 :REM 1 ASTRONOMICAL UNIT
 IN METERS
•90 G=6.67E-11         :REM  GRAV. CONSTANT
•100 M=1.99E30         :REM MASS OF SUN (KG)
•110 K=-G*M            :REM FORCE CONSTANT
•120 REM ==== INITIAL PARAMETERS ========
•130 TM=10       :REM TIME INCREMENT (DAYS)
•140 HY=4        :REM HT. OF SCREEN IN AU
•150 :REM INITIAL POSITION (AU)
•160 X0=-3
•170 Y0=1.2
•180 :REM INITIAL VELOCITY (M/S)
•190 VX=1.255E4
•200 VY=0
•210 REM ==================================
•220 DT=TM*SD    :REM TIME INCREMENT (SEC)
•230 SF=200/HY/AU      :REM PLOTTING SCALE
 FACTOR
•240 X=X0*AU : Y=Y0*AU         :REM CONVERT
 AU TO METERS
•250 REM ******** MAIN LOOP *************
•260 DD=2  :REM INITIAL TIME DIVISOR
•270 R2=X*X+Y*Y : R=SQR(R2)
•280 AX=K/R2*X/R : AY=K/R2*Y/R :REM ACCEL
 ERATION
•290 VX=VX+AX*DT/DD : VY=VY+AY*DT/DD
•300 X=X+VX*DT : Y=Y+VY*DT   :REM POSITION
•310 PX=160+SF*X : PY=100-SF*Y  :REM PLOT
 VALUES
•320 IF PX<0 OR PX>320 OR PY<0 OR PY>200
 THEN 340
•330 DRAW ,PX,PY  : REM  PLOT THE POINT
•340 T=T+DT
•350 VE=SQR(2*G/R*M)/1E3 :REM ESCAPE VELO
 CITY
•360 PRINT USING"VE= [4"#"].## KM/S";VE
•370 VT=SQR(VX*VX+VY*VY)/1E3
•380 PRINT USING"V = [4"#"].## KM/S";VT
•390 PRINT USING"R = [4"#"].## AU";R/AU;
•400 PRINT TAB(25) : PRINT USING"T= [5"#"
 ].# DAYS"; T/SD
•410 DD=1           :REM  TIME DIVISOR
•420 GET A$         :REM  CHECK KEYBOARD
•430 REM  <RETURN> STOPS PROGRAM ...
•440 ON INSTR(CHR$(13)+"PSF[UP][DOWN]",A$
```

```
 ) GOSUB  520,460,470,480,490,500
·450 GOTO 270
·460 GETKEY A$ : RETURN  :REM  PAUSE
·470 SLOW : RETURN
·480 FAST : RETURN
·490 DT=DT*1.1 : RETURN  :REM SPEED UP
·500 DT=DT*.9 : RETURN   :REM SLOW DOWN
·510 REM *********************************
·520 CHAR ,0,22,"VE= "+STR$(VE)+" KM/S"
·530 CHAR ,0,23,"V = "+STR$(VT)+" KM/S"
·540 CHAR ,0,24,"R = "+STR$(R/AU)+" AU"
·550 CHAR ,25,24,"T= "+STR$(T/SD)+" DAYS"
·560 CHAR ,0,0,"  [3"-"][3" "]BACK TO 80
 COLUMN MODE[3" "][3"-"]":   GRAPHIC 5
```

BITMAPPER

```
·1 REM =-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=    CD
·2 REM   =-=       BITMAPPER       =-=      IG
·3 REM      C-64 BIT MAP GRAPHICS           IM
·4 REM        RUPERT REPORT #28             PB
·5 REM ======  FOR C-64 ONLY!  =======      PC
·6 REM  USE -- GOSUB 1000 - TO INITIALIZE
  BIT MAP MODE                              LH
·7 REM  USE -- GOSUB 2000 - TO PLOT POINT
  AT LOCATION PX,PY                         OG
·8 REM  USE -- GOSUB 3000 - TO RETURN TO
  TEXT MODE                                 BK
·9 REM--------------------------------      EM
·10 GOSUB 1000                              FO
·20 REM -- DRAW SUN --  (OR ANY CIRCLE OF
  RADIUS R)                                 LO
·30 R=2 : FOR TH=0 TO 2*[PI] STEP .5        BL
·40 PX=160+R*COS(TH)                        GG
·50 PY=100-R*SIN(TH)                        DN
·60 NEXT                                    IA
·65 REM ********************************** DN
·66 REM LINES 440 THROUGH 485 ARE FOR USE ON
·67 REM         WITH COMET CATCHER          GB
·68 REM ********************************** DN
·435 IF SD=0 THEN A$=CHR$(13)               FE
·440 IF A$="" THEN 270                      DK
·450 IF A$=CHR$(13) THEN GOSUB 3000 : PRI
 NT CHR$(147) : END                         BC
·460 IF A$="[UP]" THEN GOSUB 490 : GOTO 2
 70                                         LO
·470 IF A$="[DOWN]" THEN GOSUB 500 : GOTO
  270                                       PB
·475 IF A$<>"P" THEN 270                    EB
·480 GET A$ : IF A$="" THEN 480             HD
·485 GOTO 270                               CJ
·486 REM ********************************** DD
·960 REM                                    JD
·970 REM >>> INITIALIZE BIT MAP MODE <<<    DI
·980 REM                                    JD
·990 REM  SET & RESET BIT FUNCTIONS         HI
·1000 DEF FNSB(N)=PEEK(MM) OR 2[UPARROW]N LG
·1010 DEF FNRB(N)=PEEK(MM) AND (255-2[UPA
 RROW]N)                                    FP
·1020 VV=53248 :REM VIC-II REGISTER 0       FL
·1030 :REM >>> PUT BIT MAP AT 8192 <<<
      (SET BIT 3 OF VIC REGISTER 24)        JA
·1040 MM=VV+24 : POKE MM,FNSB(3)            OO
·1050 :REM >>> SELECT BIT MAP MODE <<<
      (SET BIT 5 OF VIC REGISTER 17)        DH
·1060 MM=VV+17 : POKE MM,FNSB(5)            JM
·1070 BASE=8192 :REM START BIT MAP MEMORY KD
·1080 :REM >>> CLEAR BIT MAP <<<            HG
·1090 GOSUB 4000                            FB
·1100 :REM > SELECT COLORS C1 AND C0   <    KO
·1110 C1=1 : C0=0 : CC=16*C1 + C0           OM
·1120 :REM FILL SCREEN MEMORY WITH COLOR    DP
·1130 FOR MM=1024 TO 2023:POKE MM,CC:NEXT OM
·1140 RETURN                                IM
·1150 :                                     DI
·1970 REM ==============================   PE
·1980 REM > TURN ON PIXEL AT (PX,PY) <<<    GC
·1990 REM ==============================   PE
·2000 BIT=7-(PX AND 7)                      EL
·2010 MM=BASE+320*INT(PY/8)+8*INT(PX/8)+(
 PY AND 7)                                  MM
·2020 POKE MM,FNSB(BIT)                     MO
·2030 RETURN                                IM
·2040 :                                     DI
·2970 REM =========================         ME
·2980 REM >>> RESET BIT MAP MODE <<<        HI
·2990 REM =========================         ME
·3000 MM=VV+17 : POKE MM,FNRB(5)            JN
·3010 REM  RESTORE SCREEN MEMORY BASE       FI
·3020 MM=VV+24 : POKE MM,FNRB(3)            MP
·3030 RETURN                                IM
·3960 :                                     DI
·3970 =========================             DN
·3980 >>> CLEAR BIT MAP SCREEN <<<          PL
·3990 =========================             DN
·4000 FOR M=828 TO 828+43                   JD
·4010 READ B : POKE M,B                     FE
·4020 CK=CK+B                               ML
·4030 NEXT                                  IA
·4040 IF CK<>5133 THEN PRINT "DATA ERROR
 IN LINES 4060 - 4110" : STOP               DO
·4050 SYS 828: RETURN                       AM
·4060 DATA 76,68,3,0,32,31,64,0             HC
·4070 DATA 173,63,3,133,251,173,64,3        MB
·4080 DATA 133,252,174,65,3,160,0,173       FE
·4090 DATA 67,3,136,145,251,208,251,230     OC
·4100 DATA 252,202,48,7,208,244,172,66      OE
·4110 DATA 3,208,239,96                     LJ
```

MR. MYSTO
FROM PAGE 36

MAIN PROGRAM

```
·10 GOSUB830                                      CP
·20 DIMQ$(500),YN$(500)                           MC
·30 B$="[32" "]"                                  LO
·40 D$="[HOME][20"[DOWN]"]"                       FE
·50 S$="[13"[RIGHT]"]"                            PJ
·60 DB$=D$+B$+B$+B$+B$+D$                         BE
·70 YN$(0)="Y":Q$(0)="NOTHING":Q$=Q$(0)           DG
·80 REM  MR. MYSTO   1-16-85   :    C-64
 VERSION 2.0                                      HG
·90 PRINT"[CLEAR][3"[DOWN]"]","[4" "]MR.
 MYSTO",,"[6" "]BY FRANK DINUNZIO 1/16/19
 85"                                              DA
·100 PRINT:PRINT"AN EXPERIMENT IN ARTIFIC
 IAL INTELLIGENCE"                                IM
·110 PRINT,"S-START A NEW CATEGORY",,"G-G
 ET AN EXISTING ONE "                             BC
·120 GETA$:IFA$<>"S"ANDA$<>"G"THEN120             BF
·130 INPUT"[DOWN]WHICH CATEGORY";O$               IF
·140 IFA$="G"THENGOSUB770                         PC
·150 GOSUB520:PRINTDB$"DO YOU WANT ME TO
 SPEAK?":GOSUB1140:TK$=A$                         IO
·160 PRINTDB$"[8" "]PICK A WORD AND I WIL
 L TRY",,"TO DEDUCE","WHAT IT IS."                PC
·170 FORI=0TO3000:NEXT:GOSUB650                   EG
·180 R=0:GU$=YN$(0):TA$=YN$(0)                    JJ
·190 IFLEN(YN$(R))=LEN(TA$)THEN   IFYN$(R
 )=TA$THENRR=R:GOSUB1110:GOSUB650:GOTO220         CN
·200 IFR<NTHENR=R+1:GOTO190                       FA
·210 GOTO230                                      CF
·220 GOSUB1140: TA$=TA$+A$:GOTO190                JD
·230 IFA$="Y"THENPRINTDB$"I AM RIGHT AGAI
 N!":GOSUB650:FORT=1TO999:NEXT:GOTO410            CJ
·240 PRINTDB$"I AM SORRY BUT I DO NOT KNO
 W THE ANSWER,PLEASE TELL ME WHAT IT IS."         IK
·250 S=1:GOSUB650                                 KN
·260 INPUT"[6"[DOWN]"]";AA$:IFLEN(AA$)<18
 THEN280                                          CJ
·270 PRINTDB$"ANSWER MUST BE LESS THAN 18
  LETTERS.":FORI=0TO999:NEXT:GOTO240              FD
·280 TS$=Q$(RR):TL=LEN(TS$)                       FD
·290 PRINTDB$"TYPE A QUESTION THAT WILL H
 ELP ME TELL",                                    AO
·300 PRINTAA$" FROM "TS$                          KD
·310 GOSUB650:INPUT"[6"[DOWN]"]";QQ$              IG
·320 IFRIGHT$(QQ$,1)<>"?"THENQQ$=QQ$+"?"          EF
·330 PRINTDB$"ENTER THE ANSWER FOR ",,AA$
 ;" (Y/N)":GOSUB650                               EE
·340 GOSUB1140:N=N+1:P$=LEFT$(TA$,LEN(TA$
 )-1)                                             PH
·350 TS$=Q$(RR):Q$(RR)=QQ$                        CF
·360 X$="N":Z$="Y"                                MD
·370 IFA$="N"THENX$="Y":Z$="N"                    KG
·380 YN$(N)=P$+X$:Q$(N)=TS$:N=N+1                 MH
·390 YN$(N)=P$+Z$:Q$(N)= AA$                      CE
·400 BU=BU+1:IFBU>10THENBU=0:GOSUB1160            FO
·410 PRINTDB$"TRY ANOTHER?":GOSUB650:PRIN
 T"[5"[DOWN]"]"                                   NB
·420 GETA$                                        AL
·430 IFA$="N"ANDS=1THENGOSUB480:END               JP
·440 IFA$="N"THENEND                              FB
·450 IFA$="Y"THEN160                              KM
·460 IFPEEK(197)=4THEN1020                        IH
·470 GOTO420                                      CG
·480 REM ******SAVE TO DISK******                 FP
·490 PRINTDB$"SAVING "O$                          OE
·500 OPEN1,8,2,"@0:"+O$+",S,W":PRINT#1,N          IL
·510 FORW=0TON:PRINT#1,YN$(W):PRINT#1,Q$(
 W):NEXT:CLOSE1:RETURN                            AG
·520 REM ******DRAW FACE******                    PC
·530 PRINT"[CLEAR]"S$"[15"[c P]"]"                PL
·540 FORF=1TO6:PRINTS$"[c H]"S$"[c M]":NE
 XT                                               AL
·550 PRINTS$"[3"[LEFT]"][3"[c Y]"][s O][1
 3"[c Y]"][s P][3"[c Y]"]"                        JB
·560 FORF=1TO6:PRINTS$"[c G]"S$"[c M]":NE
 XT                                               MO
·570 PRINTS$"[s M][13" "][s N]"                   GP
·580 PRINTS$" [s M][11" "][s N]"                  GE
·590 PRINTS$"  [s M][9" "][s N]"                  HG
·600 PRINTS$"[3" "][s M][7" "][s N]"              CH
·610 PRINTS$"[4" "][7"[c Y]"]"                    BO
·620 PRINTS$"[HOME]"S$"[3"[RIGHT]"][4"[DO
 WN]"]MR. MYSTO"                                  LN
·630 PRINTS$"[4"[DOWN]"][4"[RIGHT]"]O[5"[
 RIGHT]"]O"                                       CL
·640 PRINTS$"[DOWN][DOWN][7"[RIGHT]"][s Q
 ]"                                               BA
·650 PRINTD$+S$"[5"[UP]"][10"[RIGHT]"]";:
 IFTK$="N"THENPRINT:RETURN                        JG
·660 S=54272:FORE=STOS+28:POKEE,0:NEXT            LA
·670 FORL=1TO10:   PRINT"[5"[LEFT]"][5"[c
 Y]"]";:PRINT"[5"[LEFT]"][s M][3"[c P]"]
 [s N]";                                          GA
·680 FORJ=1TO50:NEXT                              GF
·690 PRINT"[5"[LEFT]"][5"[c Y]"]";                KE
·700 REM ******SOUND******                        AK
·710 POKE54296, 10 :POKE54277, 85 :POKE54
 278, 245                                         MP
·720 P=INT(RND(0)*5)                              EO
·730 FORI=0TOP :REM INFLECTION                    HE
·740 RN=INT(RND(0)*6):REM PITCH                   ME
·750 POKE 54276, 33 :POKE 54273,RN+I              LO
·760 NEXT I:NEXT:POKES+24,0:PRINT:RETURN          LH
·770 REM ******LOAD ROUTINE******                 LO
·780 OPEN1,8,2,O$+",S,R"                          CL
·790 OPEN15,8,15:INPUT#15,A$:IFA$<>"00"TH
 ENCLOSE15:CLOSE1:GOTO820                         NH
·800 PRINT"LOADING "O$:INPUT#1,N                  MO
·810 FORW=0TON:INPUT#1,YN$(W),Q$(W):NEXT:
```

IMPORTANT! Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 105 and 106 explain these codes and provide other essential information on entering *Ahoy!* programs. Refer to these pages **before** entering any programs!

```
CLOSE1:RETURN                                        FE
·820 PRINT"SORRY-CAN'T FIND "O$" ON THIS
DISK":FORI=1TO3000:NEXT:RUN                          BG
·830 PRINT"[CLEAR][13" "]MR. MYSTO                   FH
·840 PRINT"A STUDY IN SEMI-ARTIFICIAL INT
ELLIGENCE[DOWN]"                                     AD
·850 PRINT"[3" "]THINK OF A WORD AND I WI
LL TRY TO[4" "]GUESS WHAT IT IS ";                   JC
·860 PRINT"BY PROCESS OF LOGIC.                      JH
·870 PRINT"[3" "]YOU WILL BE ASKED SOME C
LUE QUESTIONSTHAT MUST BE ANSWERED ";                AB
·880 PRINT"IN ORDER FOR ME TOGUESS THE WO
RD. IF I DON'T GET IT RIGHT THE FIRST";              FC
·890 PRINT" TIME, I WILL ASK YOU ONE MORE
 QUESTION AND THEN I GUARANTEE THAT YOU              DO
·900 PRINT"WON'T FOOL ME ON THAT WORD ANY
 MORE.                                               AO
·910 PRINT"[3" "]TO BEGIN YOU ARE ASKED T
O CHOOSE IF  YOU WANT TO USE PREVIOUSLY"
;                                                    FB
·920 PRINT" STORED DATA  FROM DISK OR TO
START A NEW SET OF DATA.I SUGGEST";                  NC
·930 PRINT" THAT A SEPERATE FORMATTED DIS
KBE USED FOR THE DATA FILES.                         BF
·940 PRINT"[3" "]AS THE PROGRAM RUNS IT B
ECOMES WISER WITH EACH QUESTION ASKED.";             BM
·950 PRINT" WHEN YOU ARE  FINISHED WITH T
HE PROGRAM JUST TYPE 'N'";                           FP
·960 PRINT" WHEN ASKED 'ANOTHER' AND THE
COMPILED[3" "]KNOWLEDGE ";                           CM
·970 PRINT"WILL BE SAVED TO DISK FOR[5" "
]FUTURE USE.                                         KJ
·980 PRINT"REMEMBER - I AM NO SMARTER THA
N THE USERWHO GIVES ME INFORMATION.                  GE
·990 PRINT,,"[6" "]<HIT ANY KEY>";                   NE
·1000 GETA$:IFA$=""THEN1000                          LL
·1010 RETURN                                         IM
·1020 REM ******EDIT ROUTINE******                   OF
·1030 PRINT"[CLEAR][DOWN]","C=CHANGE - N=
NEXT[DOWN]"                                          GC
·1040 FORZZ=0TON:PRINTZZ;Q$(ZZ),"(C/N)"              MI
·1050 GETA$:IFA$<>"C"ANDA$<>"N"THEN1050              PO
·1060 IFA$="N"THEN1090                               JA
·1070 PRINT"[DOWN]CHANGE "Q$(ZZ)                     AM
·1080 INPUT"[DOWN]TO ";Q$(ZZ)                        GD
·1090 IFZZ=NTHEN:PRINT"[CLEAR]":GOSUB480:
RUN20                                                GI
·1100 NEXT                                           IA
·1110 REM ******IS IT A QUESS*****                   GG
·1120 PRINTDB$;:IFRIGHT$(Q$(R),1)="?"THEN
PRINTQ$(R):RETURN                                    BB
·1130 PRINT"IS YOUR WORD "Q$(R)"?":RETURN            IG
·1140 GETA$:IFA$<>"Y"ANDA$<>"N"THEN1140              PG
·1150 RETURN                                         IM
·1160 REM ******SORT ROUTINE******                   DD
·1170 S=N:PRINTDB$"SORTING"                          GC
·1180 S=INT(S/2)                                     DM
·1190 IFS>=1THEN1220                                 OG
·1200 FR=FRE(0)-(SGN(FRE(0))<0)*65535:IFF
R>1200THENRETURN                                     AN
·1210 PRINT"MEMORY LOW - START A NEW FILE
":GOSUB480:END                                       MB
·1220 FORK=0TOS:FORI=KTON-SSTEPS                     GK
·1230 J=I:T$=YN$(I+S):TT$=Q$(I+S)                    CE
·1240 IFLEN(T$)>=LEN(YN$(J))THEN1270                 JJ
·1250 YN$(J+S)=YN$(J):Q$(J+S)=Q$(J)                  GI
·1260 J=J-S:IFJ>1THEN1240                            II
·1270 YN$(J+S)=T$:Q$(J+S)=TT$                        MH
·1280 NEXT:NEXT:GOTO1180                             NL
```

STATES DATA

```
·5 DIMYN$(30),Q$(30)                                 GN
·10 FORN=0TO21:READYN$(N),Q$(N):NEXT                 ME
·20 OPEN1,8,2,"@0:STATES,S,W"                        OE
·30 PRINT#1,N-1                                      BL
·40 FORW=0TON                                        LK
·50 PRINT#1,YN$(W)                                   GI
·60 PRINT#1,Q$(W)                                    BP
·70 NEXT                                             IA
·80 CLOSE1                                           ND
·100 END                                             IC
·120 DATA Y,IS IT A STATE?                           GK
·130 DATA YN,NOTHING                                 GK
·140 DATA YY,IS IT WEST OF THE MISSISSIPP
I?                                                   FL
·150 DATA YYN,IS IT SOUTH OF THE MASON DI
XON LINE?                                            PO
·160 DATA YYY,IS IT NORTH OF THE MASON DI
XON LINE?                                            GP
·170 DATA YYNN,IS IT ON THE GREAT LAKES?             OK
·180 DATA YYNY,IS IT A PLAINS STATE?                 PG
·190 DATA YYYY,DOES IT BORDER ON CANADA?             NK
·200 DATA YYNNN,IS IT IN NEW ENGLAND?                BO
·210 DATA YYNNY,MICHIGAN                             GH
·220 DATA YYNYY,TENNESSEE                            FA
·230 DATA YYYYN,OREGON                               CL
·240 DATA YYYNN,IS IT ON THE PACIFIC COAS
T?                                                   CL
·250 DATA YYYNY,KANSAS                               CE
·260 DATA YYNYN,FLORIDA                              GH
·270 DATA YYYYY,WASHINGTON                           DG
·280 DATA YYNNNY,MAINE                               BO
·290 DATA YYNNNN,IS IT ON THE ATLANTIC CO
AST?                                                 AM
·300 DATA YYYNNY,CALIFORNIA                          HP
·310 DATA YYYNNN,LOUISIANA                           FN
·320 DATA YYNNNNN,PENNSYLVANIA                       GP
·330 DATA YYNNNNY,NEW JERSEY                         LE
```

AIR RESCUE
FROM PAGE 35

Starting address in hex: C000
Ending address in hex: C6FA
SYS to start: 49152

***Flankspeed* required for entry! See page 106.**

```
C000: 20 C9 C8 20 0A C5 AD BB 0C
C008: 02 38 C9 05 90 24 EE AA 5F
C010: 02 20 4B C7 A2 01 A0 F4 7E
C018: 20 FA C4 A9 00 8D BB 02 EC
C020: A9 14 8D B6 02 AD AA 02 7E
C028: C9 06 D0 06 EE AC 02 20 8C
C030: 5A C6 AD 11 D0 10 FB AD 9A
C038: 1E D0 29 3F 8D B8 02 AD 85
C040: 1F D0 8D C0 02 20 E0 C1 43
C048: 20 BC C2 20 1B C3 20 A1 A8
C050: C6 20 1D C4 20 59 C4 AD 05
C058: C0 02 29 01 F0 03 4C 57 DC
C060: C1 AD B8 02 F0 A0 C9 12 F7
C068: D0 22 A2 04 20 A1 C1 A9 2F
C070: 00 8D AB 02 A9 FD 2D 15 95
C078: D0 8D 15 D0 A2 00 A0 32 32
C080: 20 FA C4 CE B6 02 AD 1E B3
C088: D0 4C 06 C0 AD B8 02 C9 9E
C090: 0A D0 22 A2 03 20 A1 C1 B6
C098: A9 00 8D AB 02 A9 FD 2D 52
C0A0: 15 D0 8D 15 D0 A2 00 A0 3D
C0A8: 19 20 FA C4 CE B6 02 AD D6
C0B0: 1E D0 4C 06 C0 AD B8 02 1B
C0B8: C9 21 D0 12 AD FD 07 C9 03
C0C0: F8 D0 03 4C 57 C1 A9 D0 6D
C0C8: 8D 0C D0 4C 06 C0 AD B8 AC
C0D0: 02 C9 06 D0 35 A9 02 8D E1
C0D8: B1 02 A9 FA 85 A2 A9 03 06
C0E0: 8D 21 D0 A5 A2 D0 FC A9 20
C0E8: 00 8D AB 02 8D 21 D0 A2 46
C0F0: 00 A0 4B 20 FA C4 A9 FD 64
C0F8: 2D 15 D0 8D 15 D0 CE B6 05
C100: 02 20 33 C6 AD 1E D0 4C 05
C108: 06 C0 AD B8 02 C9 05 D0 D6
C110: 30 AD 01 D0 C9 82 F0 07 04
C118: AD B1 02 C9 02 D0 22 AD E5
C120: 25 D0 29 0F D0 03 4C 06 74
C128: C0 A2 00 A0 C8 20 FA C4 D4
C130: EE BB 02 A9 00 8D 25 D0 0A
C138: 20 5A C6 AD 1E D0 4C 06 68
C140: C0 AD B8 02 C9 05 F0 0F 38
C148: C9 09 F0 0B C9 11 F0 07 E9
C150: C9 31 F0 03 4C 06 C0 A2 F4
C158: 00 20 A1 C1 20 33 C6 20 16
C160: 74 C6 4C 91 C1 A9 00 8D 72
C168: AA 02 8D BB 02 8D AE 02 9E
C170: 8D AF 02 A9 0B 8D 21 D0 E3
C178: 20 28 C6 A5 C5 C9 04 D0 91
C180: FA 20 99 C5 A9 03 8D AC E1
C188: 02 A9 00 8D 21 D0 4C 06 06
C190: C0 CE AC 02 F0 CF A9 20 59
C198: 20 99 C5 AD 1E D0 4C 06 07
C1A0: C0 BD F8 07 8D B9 02 A9 12
C1A8: F4 9D F8 07 BD C1 C8 0D 90
C1B0: 1C D0 8D 1C D0 8A 48 20 0B
C1B8: 33 C6 68 AA A0 F9 84 A2 87
C1C0: A4 A2 D0 FC BD C1 C8 4D 6B
C1C8: 1C D0 8D 1C D0 A9 FF 38 12
C1D0: FD C1 C8 2D 15 D0 8D 15 0F
C1D8: D0 AD B9 02 9D F8 07 60 11
C1E0: AD 0C D0 C9 A0 D0 09 AD 5D
C1E8: 15 D0 29 FD 8D 15 D0 60 C9
C1F0: AD 00 DC AA 29 0F C9 0B 33
C1F8: D0 0E AD 00 D0 38 C9 1E 76
C200: 90 4F CE 00 D0 4C 29 C2 B7
C208: C9 07 D0 0E AD 00 D0 38 6E
C210: C9 EB B0 3D EE 00 D0 4C BF
C218: 29 C2 C9 0E D0 1B AD 01 76
C220: D0 38 C9 4B 90 2B CE 01 C9
C228: D0 CE BA 02 D0 08 A9 14 1B
C230: 8D BA 02 CE 0C D0 4C 51 C3
C238: C2 C9 0D D0 14 AD 01 D0 36
C240: 38 C9 C8 B0 0C EE 01 D0 88
C248: EE 03 D0 EE 03 D0 4C 29 43
C250: C2 AD B6 02 F0 46 AD AB 0A
C258: 02 D0 24 8A 29 10 D0 3C 20
C260: AD 00 D0 18 69 0F 8D 02 FE
C268: D0 AD 01 D0 18 69 0F 8D D6
C270: 03 D0 A9 02 0D 15 D0 8D 70
C278: 15 D0 A9 01 8D AB 02 EE 33
C280: 28 D0 EE 02 D0 F0 05 EE 20
C288: 02 D0 D0 10 A9 FD 2D 15 26
C290: D0 8D 15 D0 A9 00 8D AB B7
C298: 02 CE B6 02 CE B2 02 D0 76
C2A0: 1A A9 06 8D B2 02 A9 03 59
C2A8: 38 ED B0 02 8D B0 02 18 D9
C2B0: 69 F4 8D F8 07 AD 01 D0 1C
C2B8: 8D 00 D4 60 AD B4 02 30 10
C2C0: 59 AE AD 02 CA 8E AD 02 81
C2C8: D0 3C A9 05 8D AD 02 AE 70
C2D0: 0A D0 CA E0 FF D0 2C AD 02
C2D8: 10 D0 29 20 D0 1D AD B4 53
C2E0: 02 49 FF 10 16 8D B4 02 96
C2E8: AD 15 D0 29 DF 8D 15 D0 F8
C2F0: A9 DF 2D 10 D0 8D 10 D0 F6
C2F8: 4C 06 C3 A9 20 4D 10 D0 07
C300: 8D 10 D0 CE 0A D0 CE BF A6
C308: 02 D0 0F A9 04 8D BF 02 E6
C310: AD AD 02 0A 18 69 4B 8D D1
C318: 0B D0 60 AE 04 D0 CA E0 83
C320: FF D0 26 AD 10 D0 29 04 D2
C328: D0 17 A9 04 0D 15 D0 8D 3E
C330: 15 D0 A9 06 8D B1 02 A9 B0
C338: 38 8D 04 D0 A9 01 8D 25 30
C340: D0 AD 10 D0 49 04 8D 10 8A
C348: D0 CE 04 D0 AD B0 02 18 35
C350: 6D B1 02 8D 26 D0 AD B0 54
C358: 02 18 69 FC 8D FA 07 60 C8
C360: AD B4 02 10 79 AD B7 02 B5
```

```
C368: D0 35 AD 10 D0 29 10 D0 07
C370: 6D AD 08 D0 38 C9 FA 90 F1
C378: 65 AD 09 D0 8D 0B D0 AD 7C
C380: 08 D0 38 E9 05 8D 0A D0 E8
C388: A9 01 8D B7 02 A9 20 0D 51
C390: 15 D0 8D 15 D0 A9 F8 8D 1A
C398: FD 07 A9 01 8D 2C D0 AD 80
C3A0: 0A D0 38 E9 0F 8D 0A D0 15
C3A8: B0 34 AD 15 D0 29 DF 8D B7
C3B0: 15 D0 A9 FF 8D 0A D0 A9 52
C3B8: 50 8D 0B D0 AD 10 D0 09 0A
C3C0: 20 8D 10 D0 A9 00 8D B7 3E
C3C8: 02 8D B4 02 A9 07 8D 2C 79
C3D0: D0 A9 F9 8D FD 07 A9 20 A1
C3D8: 0D 15 D0 8D 15 D0 AD AA 97
C3E0: 02 18 69 03 8D B5 02 AA 57
C3E8: CA 8E C1 02 AD 08 D0 38 C4
C3F0: ED B5 02 8D 08 D0 B0 1B C8
C3F8: A9 10 4D 10 D0 8D 10 D0 4F
C400: 29 10 F0 0E AD 01 D0 8D 45
C408: 09 D0 A9 10 0D 15 D0 8D 1C
C410: 15 D0 60 8D 08 D0 8D 09 53
C418: D4 8D 05 D4 60 20 60 C3 F8
C420: AD 06 D0 38 ED C1 02 8D 1C
C428: 06 D0 8D 0A D4 8D 07 D4 D4
C430: B0 26 A9 08 4D 10 D0 8D 74
C438: 10 D0 AD 10 D0 29 08 F0 C9
C440: 16 20 97 E0 A5 8B 8D 07 B4
C448: D0 38 E9 71 8D 2A D0 A9 DE
C450: 08 0D 15 D0 8D 15 D0 60 1F
C458: 60 AD AE 02 38 CD A8 02 C7
C460: F0 04 90 19 B0 0B AD AF 18
C468: 02 38 CD A9 02 F0 02 90 9F
C470: 0C AD AE 02 8D A8 02 AD C0
C478: AF 02 8D A9 02 A2 01 A0 A7
C480: 06 18 20 F0 FF A9 12 20 8B
C488: D2 FF A9 05 20 D2 FF AD AA
C490: A8 02 AE A9 02 20 CD BD 41
C498: A2 01 A0 22 18 20 F0 FF 28
C4A0: AD AE 02 AE AF 02 20 CD 4D
C4A8: BD A9 9A 20 D2 FF A2 02 42
C4B0: A0 08 18 20 F0 FF AE AC DD
C4B8: 02 A9 00 20 CD BD A2 02 B4
C4C0: A0 11 18 20 F0 FF AE B6 01
C4C8: 02 A9 00 20 CD BD A9 20 E9
C4D0: 20 D2 FF A9 05 20 D2 FF 65
C4D8: A2 02 A0 19 18 20 F0 FF 60
C4E0: AE BB 02 A9 00 20 CD BD A2
C4E8: A2 02 A0 24 18 20 F0 FF 7B
C4F0: AE AA 02 E8 A9 00 20 CD CC
C4F8: BD 60 98 18 6D AF 02 8D 74
C500: AF 02 8A 6D AE 02 8D AE 96
C508: 02 60 A9 8E 20 D2 FF A9 3F
C510: 08 20 D2 FF AD 16 D0 29 C8
C518: F7 8D 16 D0 20 F3 C6 A9 09
C520: 00 8D A8 02 8D A9 02 8D 1F
C528: AE 02 8D AF 02 8D 17 D0 8D
C530: 8D 21 D0 8D AA 02 8D BB 33
C538: 02 A9 02 8D B0 02 8D BF 73
C540: 02 8D B2 02 8D BA 02 A9 78
C548: 04 8D 1B D0 A9 FC 8D F9 F3
C550: 07 A9 FD 8D FA 07 A9 FA 33
C558: 8D FC 07 8D FB 07 A9 F9 1E
C560: 8D FD 07 A9 FB 8D FE 07 2C
C568: A9 F7 8D FF 07 A9 0F 8D E4
C570: 27 D0 8D 20 D0 A9 03 8D 21
C578: 28 D0 8D AC 02 A9 0A 8D EE
C580: 2A D0 A9 07 8D 26 D0 8D 3E
C588: 2C D0 A9 01 8D 2E D0 A9 66
C590: 02 8D 2B D0 A9 0B 8D 2D 8B
C598: D0 A9 E1 8D 1D D0 A9 06 20
C5A0: 8D 1C D0 8D A7 02 8D B1 91
C5A8: 02 A9 93 20 D2 FF 20 5E 59
C5B0: C7 20 4B C7 A9 F5 8D F8 D1
C5B8: 07 A9 01 8D 25 D0 A9 34 CB
C5C0: 8D 10 D0 A9 00 8D AB 02 14
C5C8: A9 14 8D B6 02 A2 0F BD 3C
C5D0: B1 C8 9D 00 D0 CA 10 F7 8C
C5D8: A9 FD 8D 15 D0 20 28 C6 03
C5E0: A9 06 8D 18 D4 A9 01 8D 43
C5E8: 01 D4 A9 4B 8D 00 D4 A9 BF
C5F0: 81 8D 05 D4 A9 81 8D 06 98
C5F8: D4 A9 21 8D 04 D4 A9 07 AF
C600: 8D 08 D4 A9 06 8D 07 D4 83
C608: A9 81 8D 0C D4 A9 81 8D 5A
C610: 0D D4 A9 64 8D 0A D4 A9 16
C618: 64 8D 09 D4 A9 41 8D 0B 6B
C620: D4 AD 1E D0 AD 1F D0 60 8F
C628: A2 18 A9 00 9D 00 D4 CA C9
C630: D0 FA 60 A9 09 8D 0F D4 80
C638: A9 05 8D 0E D4 A9 09 8D 97
C640: 13 D4 A9 F0 8D 12 D4 A9 E0
C648: 81 8D 12 D4 A9 F0 85 A2 01
C650: A5 A2 D0 FC A9 80 8D 12 30
C658: D4 60 A9 39 8D 0F D4 A9 8B
C660: 63 8D 0E D4 A9 09 8D 13 87
C668: D4 A9 0A 8D 14 D4 A9 11 22
C670: 8D 12 D4 60 A9 08 8D 13 97
C678: D4 A9 FF 8D 14 D4 A9 15 2C
C680: 8D 12 D4 A2 28 A0 28 8C 15
C688: 0E D4 88 D0 FA A9 FC 85 EB
C690: A2 A5 A2 D0 FC 8E 0F D4 BB
C698: CA D0 EA A9 00 8D 12 D4 3D
C6A0: 60 AD 16 D0 29 F8 18 6D 3D
C6A8: A7 02 8D 16 D0 AE A7 02 1F
C6B0: CA 10 05 20 BC C6 A2 07 DD
C6B8: 8E A7 02 60 AD 11 D0 10 F0
C6C0: FB A9 E0 85 FB A9 05 85 FC
C6C8: FC A2 08 A0 00 C8 B1 FB 87
C6D0: 88 91 FB C8 C0 27 D0 F5 5E
C6D8: A0 00 B1 FB A0 27 91 FB 7C
C6E0: 18 A5 FB 69 28 85 FB A5 53
C6E8: FC 69 00 85 FC A0 00 CA 3D
C6F0: D0 DB 60 78 A9 12 8D 14 D3
C6F8: 03 A9 C7 6D
```

SWOOP
FROM PAGE 53

Starting address in hex: C000
Ending address in hex: C6DE
SYS to start: 49152

***Flankspeed* required for entry! See page 106.**

```
C000: A0 00 B9 9F C5 99 80 3E 18
C008: C8 D0 F7 B9 9F C6 99 80 D3
C010: 3F C8 10 F7 A0 40 A9 00 AA
C018: 99 C0 3F 88 10 FA A0 18 FD
C020: A9 C3 99 E5 3F 88 88 88 E5
C028: 10 F8 A9 00 8D 7E C5 A9 56
C030: C9 8D 01 D0 78 A9 7F 8D 88
C038: 0D DC A9 01 8D 1A D0 A9 EE
C040: DF 8D 12 D0 A9 1B 8D 11 F3
C048: D0 A9 FB 8D 14 03 A9 C3 D0
C050: 8D 15 03 58 A0 00 B9 86 2F
C058: C5 99 00 D4 C8 C0 19 90 BF
C060: F5 A9 CA A0 C4 20 1E AB 1A
C068: 18 A2 16 A0 03 20 F0 FF ED
C070: A9 CE A0 C4 20 1E AB 20 58
C078: 58 C3 A9 33 8D DF 07 A9 8F
C080: 14 8D 85 C5 A9 B0 8D 2B 80
C088: C5 8D 00 D0 A9 00 8D 2C 10
C090: C5 8D 10 D0 18 A2 18 A0 38
C098: 09 20 F0 FF 38 A9 15 ED 97
C0A0: 85 C5 AA A9 00 20 CD BD EB
C0A8: A9 20 20 D2 FF A9 FD 8D 9A
C0B0: F8 07 8D 84 C5 A9 FF 8D BF
C0B8: FF 07 A9 0D 8D 27 D0 A0 9C
C0C0: 05 AD 1B D4 29 1F 99 2D 72
C0C8: C5 88 10 F5 A2 07 AD 15 89
C0D0: D0 49 01 8D 15 D0 A5 A2 A7
C0D8: 18 69 0A C5 A2 D0 FC CA 65
C0E0: D0 EC 8E 84 C5 A9 7F 8D 2E
C0E8: 15 D0 A9 37 85 02 A2 05 DE
C0F0: BD 2D C5 C9 37 B0 03 FE 55
C0F8: 2D C5 CA 10 F3 20 0D C3 AB
C100: A5 A2 C5 A2 F0 FC C6 02 67
C108: D0 E4 AD 1E D0 AD 1F D0 F7
C110: A2 05 AD 8D 02 8D 84 C5 CC
C118: D0 F8 BD 2D C5 F0 43 18 DE
C120: 7D 42 C5 C9 D0 B0 1D C9 D7
C128: 34 90 19 9D 2D C5 18 BD 6C
C130: 34 C5 7D 48 C5 A8 BD 3B 57
C138: C5 7D 4E C5 85 02 D0 0A F1
C140: C0 1C B0 0A 20 39 C3 4C 41
C148: 62 C1 C0 40 B0 F6 AD 1B DD
C150: D4 29 3F F0 EF 98 9D 34 D8
C158: C5 A5 02 F0 02 A9 01 9D 01
C160: 3B C5 CA 10 AD AD 33 C5 90
C168: F0 1F 18 69 04 C9 CB 90 24
C170: 0A AD 15 D0 29 7F 8D 15 59
C178: D0 A9 00 8D 33 C5 AD 1B 42
C180: D4 09 08 8D 2E D0 4C CF 0F
C188: C1 A2 05 38 BD 34 C5 ED CF
C190: 2B C5 85 02 BD 3B C5 ED B5
C198: 2C C5 05 02 F0 06 CA 10 63
C1A0: EA 4C CF C1 AD 15 D0 3D 3A
C1A8: 64 C5 F0 23 BD 2D C5 C9 61
C1B0: AA B0 1C 8D 33 C5 BD 34 A0
C1B8: C5 8D 3A C5 BD 3B C5 8D 58
C1C0: 41 C5 A9 FF 8D FF 07 AD B3
C1C8: 15 D0 09 80 8D 15 D0 AD 59
C1D0: 00 DC 29 10 D0 41 AD 7E 25
C1D8: C5 D0 3C 38 AD 2B C5 E9 6C
C1E0: 1C AA 85 02 AD 2C C5 E9 B8
C1E8: 00 4A 66 02 46 02 46 02 2C
C1F0: 18 A5 02 69 FA 85 FB 85 1C
C1F8: FD A9 06 69 00 85 FC 18 AA
C200: 69 D4 85 FE 8A 29 07 4A C7
C208: AA BD 7F C5 8D 83 C5 A9 36
C210: 15 8D 04 D4 EE 7E C5 AD 6C
C218: 1F D0 29 FE F0 62 85 02 0B
C220: 8D 84 C5 A9 81 8D 0B D4 90
C228: A0 06 06 02 90 2F A9 FE 3F
C230: 99 F9 07 84 04 20 85 C3 BC
C238: A4 04 A2 03 AD 1B D4 29 4D
C240: 07 F0 F9 99 28 D0 A5 A2 0D
C248: C5 A2 F0 FC CA D0 ED AD D5
C250: 15 D0 39 6B C5 8D 15 D0 14
C258: A9 00 99 2D C5 88 10 CA F1
C260: A0 00 AD 7E C5 F0 0B C9 B8
C268: 14 B0 07 8C 7E C5 A9 20 CE
C270: 91 FB 8C 84 C5 8C 04 D4 3A
C278: A9 80 8D 0B D4 AD 1F D0 AD
C280: AD 15 D0 29 FE D0 13 38 58
C288: AD 85 C5 E9 01 C9 08 90 CE
C290: 03 8D 85 C5 20 BB C3 4C 58
C298: 94 C0 AE 85 C5 A0 00 C8 51
C2A0: D0 FD CA D0 FA AD 1E D0 A2
C2A8: 29 01 F0 5B 8D 84 C5 A9 A0
C2B0: FE 8D F8 07 A9 81 8D 0B 01
C2B8: D4 A2 03 AD 1B D4 29 07 01
C2C0: F0 F9 8D 27 D0 A5 A2 C5 3F
C2C8: A2 F0 FC CA D0 ED A9 80 0D
C2D0: 8D 0B D4 AD 7E C5 F0 09 2A
C2D8: C9 13 B0 05 A9 14 8D 7E 35
C2E0: C5 A2 00 8E 84 C5 AD 15 E4
C2E8: D0 29 7E 8D 15 D0 20 BB B0
C2F0: C3 8E 15 D0 CE DF 07 AD 8C
C2F8: DF 07 29 0F D0 06 20 C5 D4
C300: C3 4C 77 C0 4C 84 C0 20 F9
C308: 0D C3 4C 10 C1 A2 06 8A 2A
C310: 0A A8 BD 2D C5 99 03 D0 E0
C318: BD 34 C5 99 02 D0 BD 3B 35
C320: C5 F0 09 AD 10 D0 1D 64 EF
C328: C5 4C 32 C3 AD 10 D0 3D FB
```

Entry of hexadecimal program listings in *Ahoy!* requires the use of our *Flankspeed* machine language entry program. See the documentation and listing for *Flankspeed* on page 106.

```
C330: 6B C5 8D 10 D0 CA 10 D7 82
C338: 60 AD 1B D4 29 07 A8 B9 C8
C340: 54 C5 9D 42 C5 AD 1B D4 9D
C348: 29 07 A8 B9 54 C5 9D 48 DA
C350: C5 B9 5C C5 9D 4E C5 60 04
C358: A0 00 B9 79 07 D9 8F 07 A3
C360: F0 05 B0 0B 4C 7A C3 C8 65
C368: C0 06 90 EE 4C 7A C3 A0 D9
C370: 05 B9 79 07 99 8F 07 88 68
C378: 10 F7 A0 05 A9 30 99 79 13
C380: 07 88 10 FA 60 AD 7B 07 AB
C388: 48 38 A9 15 ED 85 C5 AA AB
C390: A0 04 38 B9 79 07 69 00 11
C398: C9 3A 90 02 A9 30 99 79 1C
C3A0: 07 88 10 EF CA D0 E9 68 1E
C3A8: CD 7B 07 F0 0D 18 AD DF 9C
C3B0: 07 69 01 C9 3A B0 03 8D 67
C3B8: DF 07 60 A5 A2 18 69 64 2E
C3C0: C5 A2 D0 FC 60 A2 0A A0 A4
C3C8: 0E 18 20 F0 FF A9 1B A0 65
C3D0: C5 20 1E AB A0 0C B9 9E 85
C3D8: D9 49 05 99 9E D9 88 10 AB
C3E0: F5 A5 A2 18 69 14 C5 A2 1D
C3E8: D0 FC A5 CB C9 40 F0 E4 08
C3F0: A0 0C A9 20 99 9E 05 88 2D
C3F8: 10 FA 60 A9 01 8D 19 D0 86
C400: A2 0B A0 0B AD 12 D0 10 F9
C408: 03 4C B4 C4 AD 84 C5 F0 B9
C410: 03 4C B0 C4 EE 72 C5 AD A9
C418: 72 C5 29 07 D0 14 EE 79 CD
C420: C5 AD 79 C5 29 03 AA BD 67
C428: 7A C5 A0 05 99 F9 07 88 31
C430: 10 FA AD 00 DC 29 0C 49 44
C438: 0C 4A 4A A8 18 AD 2B C5 38
C440: 79 73 C5 AA AD 2C C5 79 B6
C448: 76 C5 F0 07 E0 40 B0 1B 69
C450: 4C 57 C4 E0 1C 90 14 8E E8
C458: 2B C5 8E 00 D0 8D 2C C5 28
C460: AD 10 D0 29 FE 0D 2C C5 16
C468: 8D 10 D0 AD 7E C5 F0 40 F9
C470: A0 00 A9 20 91 FB 38 A5 46
C478: FB E9 28 85 FB 85 FD A5 31
C480: FC E9 00 85 FC 18 69 D4 40
C488: 85 FE AD 7E C5 C9 14 90 6D
C490: 0B 8C 7E C5 A9 14 8D 04 BB
C498: D4 4C B0 C4 A9 01 91 FD 69
C4A0: AD 83 C5 91 FB EE 7E C5 58
C4A8: AD 7E C5 0A 0A 8D 01 D4 12
C4B0: A2 DF A0 00 8E 12 D0 8C D1
C4B8: 21 D0 8C 20 D0 AD 0D DC BF
C4C0: 29 01 F0 03 4C 31 EA 4C 93
C4C8: BC FE 8E 08 93 00 9E 53 A0
C4D0: 43 4F 52 45 20 05 30 30 80
C4D8: 30 30 30 30 20 20 20 20 1A
C4E0: 20 20 20 20 20 20 9F 48 89
C4E8: 49 47 48 20 20 05 30 30 67
C4F0: 30 30 30 30 0D 0D 20 20 0C
C4F8: 20 96 4C 45 56 45 4C 20 49
C500: 05 31 20 20 20 20 20 20 F6
C508: 20 20 20 20 20 20 20 20 09
C510: 20 99 4C 49 56 45 53 20 6E
C518: 05 33 00 1C 50 52 45 53 A7
C520: 53 20 41 4E 59 20 4B 45 2D
C528: 59 05 00 00 00 00 00 00 86
C530: 00 00 00 00 2D 5A 9B AA FD
C538: D7 F0 1E 00 00 00 00 00 1F
C540: 00 01 01 01 FF FF 01 01 45
C548: 01 00 01 00 01 00 00 00 4B
C550: 00 00 00 00 01 FF 02 FE 52
C558: 03 FD 01 FE 00 FF 00 FF 59
C560: 00 FF 00 FF 02 04 08 10 7E
C568: 20 40 80 FD FB F7 EF DF 0B
C570: BF 7F FF 00 FE 02 00 FF B0
C578: 00 00 FA FB FC FB 00 74 DC
C580: 54 42 6A 00 00 00 00 00 81
C588: 00 00 00 00 F0 00 08 00 81
C590: 00 00 00 F9 00 FF 00 00 8A
C598: 80 00 00 00 28 01 9F 00 E1
C5A0: 00 00 00 00 00 00 00 00 A0
C5A8: 20 00 04 10 00 08 18 00 FC
C5B0: 18 18 00 18 0C 81 30 0E C4
C5B8: 42 70 07 66 E0 07 99 E0 3B
C5C0: 03 FF C0 00 FF 00 00 3C C0
C5C8: 00 00 00 00 00 00 00 00 C8
C5D0: 00 00 00 00 00 00 00 00 D0
C5D8: 00 00 00 00 00 00 00 00 D8
C5E0: 00 00 00 00 00 00 00 00 E0
C5E8: 00 00 00 00 00 00 00 00 E8
C5F0: 00 00 81 00 00 42 00 0E C2
C5F8: 66 70 3F 99 FC 63 FF C6 CF
C600: 80 FF 01 00 3C 00 00 00 BD
C608: 00 00 00 00 00 00 00 00 08
C610: 00 00 00 00 00 00 00 00 10
C618: 00 00 00 00 00 00 00 00 18
C620: 00 00 00 00 00 00 00 00 20
C628: 00 00 00 00 81 00 00 42 EB
C630: 00 00 66 00 03 99 C0 0F 03
C638: FF F0 1E FF 78 18 3C 18 2C
C640: 30 00 0C 30 00 0C 20 00 D8
C648: 04 20 00 04 00 00 00 00 70
C650: 00 00 00 00 00 00 00 00 50
C658: 00 00 00 00 00 00 00 00 58
C660: 00 00 00 3C 00 00 3C 00 D8
C668: 00 3C 00 00 3C 00 00 3C 1D
C670: 00 00 7E 00 00 3C 00 00 2B
C678: 7E 00 00 7E 00 00 FF 00 75
C680: 08 7E 10 18 FF 18 39 FF 80
C688: 9C 3B FF DC 3F FF FC 3E B7
C690: 7E 7C 3C 3C 3C 38 00 1C 94
C698: 38 00 1C 38 00 1C 00 00 41
C6A0: 00 00 00 24 00 01 99 80 DF
C6A8: 00 42 00 10 66 08 0E 24 9B
```

```
C6B0: 70 43 00 C2 06 00 60 E0 6E
C6B8: 22 07 3B 00 DC 01 00 80 7B
C6C0: 30 08 0C 62 81 46 0C 24 5F
C6C8: 30 30 66 0C 01 C3 80 17 F7
C6D0: 18 E8 04 24 20 00 66 00 80
C6D8: 00 00 00 00 00 00 00 D8
```

CHRONO-WEDGE

FROM PAGE 61

Starting address in hex: C000
Ending address in hex: CD43
SYS to start: 49152

***Flankspeed* required for entry! See page 106.**

```
C000: 20 6E C9 20 93 C6 A2 02 77
C008: BD B3 C9 95 7C CA 10 F8 29
C010: A5 BA C9 08 B0 02 A9 08 A6
C018: 8D C7 CC 09 30 8D C6 C9 91
C020: A9 00 8D BA CC 4C 47 C1 34
C028: 8D BC CC 8E BB CC BA BD CE
C030: 01 01 C9 8C D0 18 BD 02 31
C038: 01 C9 A4 D0 11 A2 00 86 B2
C040: 90 AD BC CC DD A7 C9 F0 48
C048: 16 E8 E0 06 90 F6 AD BC 20
C050: CC 18 AE BB CC C9 3A B0 21
C058: 03 4C 80 00 4C 8A 00 8D 8C
C060: BE CC 8E B7 CC AD B6 C9 2D
C068: 85 BA 8D C7 CC 20 72 C5 23
C070: AE B7 CC 8A 0A AA BD 12 B2
C078: CA 48 BD 11 CA 48 60 A9 77
C080: A7 A0 CC 20 65 C6 A9 C9 55
C088: A0 CC 20 65 C6 A2 50 BD F2
C090: C9 CC 9D CB CC CA 10 F7 30
C098: 20 9F C6 4C 47 C1 AD 01 23
C0A0: 02 C9 24 D0 03 4C 1B C2 8E
C0A8: C9 54 D0 06 20 93 C6 4C 64
C0B0: 47 C1 C9 50 D0 1B AD 02 6F
C0B8: 02 C9 34 F0 0D C9 35 F0 A6
C0C0: 09 A9 B1 A0 CB 20 65 C6 DD
C0C8: F0 E5 25 0F 8D BA CC D0 B9
C0D0: DE C9 44 D0 1C AD 02 02 5C
C0D8: C9 38 F0 0F C9 39 F0 0B D9
C0E0: A9 DA A0 CB 20 65 C6 F0 0F
C0E8: C6 D0 C4 8D C7 CC 4C 18 CB
C0F0: C0 C9 51 D0 03 4C 4C C6 FF
C0F8: C9 3F D0 2F A9 5A A0 CC 73
C100: 20 65 C6 F0 AA 20 65 C6 34
C108: F0 3D AD C7 CC 85 BA 20 D8
C110: B1 FF A9 F0 20 B9 ED 24 48
C118: 90 10 0D 20 AE FF A9 BF FD
C120: A0 C9 20 65 C6 4C B6 C5 9F
C128: 4C AE FF A5 BA 20 B1 FF 55
C130: A9 6F 85 B9 20 93 FF A0 DC
C138: 00 B9 01 02 F0 06 20 A8 B4
C140: FF C8 10 F5 20 AE FF 20 FD
C148: 0A C1 A9 BF A0 C9 20 65 6D
C150: C6 AD C7 CC 20 B4 FF A9 D7
C158: 6F 85 B9 20 96 FF A9 00 67
C160: 8D B4 CC 8D B5 CC 20 A5 45
C168: FF AA EE B4 CC AD B4 CC B2
C170: C9 02 D0 03 8E B5 CC 8A AB
C178: 20 D2 FF C9 0D D0 E7 20 1B
C180: AB FF AD B3 CC F0 01 60 AC
C188: 4C 4F C6 A2 00 8E BD CC A6
C190: 20 69 C3 20 98 C8 A2 07 09
C198: BD 74 CA 8E B7 CC AA 8E E1
C1A0: BB CC 20 C8 C1 B0 0C AD 3E
C1A8: BB CC AE B7 CC 20 D9 C1 20
C1B0: 90 15 18 AE B7 CC CA 10 7C
C1B8: DF AD 00 CE D0 D2 A9 66 C8
C1C0: A0 CB 20 65 C6 F0 80 60 4B
C1C8: BD 00 CE C9 05 90 08 29 E5
C1D0: 0F C9 00 F0 02 18 60 38 4D
C1D8: 60 8E B7 CC AA 8E BB CC 0E
C1E0: 20 00 C2 CC C8 CC D0 16 0D
C1E8: AE BB CC A0 00 BD 03 CE 50
C1F0: D9 CB CC D0 09 E8 C8 CC BB
C1F8: C8 CC D0 F1 18 60 38 60 62
C200: A0 00 BD 03 CE F0 08 C9 F2
C208: A0 F0 04 E8 C8 D0 F3 60 74
C210: A2 26 A9 2D 20 D2 FF CA 6D
C218: 10 F8 60 A2 00 8E BD CC 3D
C220: BD 1D CA 30 06 9D 02 CA 66
C228: E8 D0 F5 A2 00 BD 03 02 3D
C230: F0 03 E8 D0 F8 8E CA C9 F9
C238: A9 60 8D 7B C9 20 98 C8 96
C240: AD 02 CE C9 41 F0 04 C9 88
C248: 42 D0 75 AD BA CC F0 03 F9
C250: 20 75 C9 20 89 C6 20 10 50
C258: C2 A9 B7 A0 C9 20 65 C6 33
C260: A2 90 BD 00 CE 29 7F 20 E8
C268: D2 FF E8 E0 A2 D0 F3 A9 16
C270: 2C 20 D2 FF BD 00 CE 20 3C
C278: D2 FF BD 01 CE 20 D2 FF CB
C280: AD A5 CE 8D 48 CA AD A6 97
C288: CE 8D 49 CA A9 3E A0 CA 4C
C290: 20 65 C6 A9 60 A0 CA 20 72
C298: 65 C6 20 10 C2 20 89 C6 28
C2A0: 20 69 C3 20 98 C8 20 96 26
C2A8: C3 AD 00 CE D0 F2 A2 01 50
C2B0: 8E 3D CA CA 8E C5 CC 20 53
C2B8: 89 C6 20 CC FF 20 D0 C2 A9
C2C0: A9 00 8D C5 CC 8D BA CC 9F
C2C8: A9 09 8D 13 C9 4C 47 C1 3B
C2D0: A9 AE 85 BB A9 C9 85 BC 20
C2D8: A9 05 85 B7 AD C7 CC 85 8C
C2E0: BA A9 60 85 B9 20 D5 F3 CE
C2E8: A5 BA 20 B4 FF A5 B9 20 9D
C2F0: 96 FF A9 00 85 90 A0 22 0A
C2F8: 20 A5 FF 88 10 FA 48 20 BA
C300: A5 FF 8D D4 CC 68 8D D3 9E
C308: CC A2 00 20 A5 FF F0 06 34
C310: 9D D5 CC E8 D0 F5 20 3F 5F
C318: C3 AD BA CC F0 03 20 75 9A
C320: C9 AD D4 CC AE D3 CC 20 A8
C328: 0C C9 A9 20 20 D2 FF A2 5D
```

```
C330: 00 BD D5 CC 20 D2 FF E8 6C
C338: E0 0C 90 F5 20 89 C6 20 3C
C340: 42 F6 4C E7 FF 20 E1 FF AF
C348: F0 10 20 E4 FF F0 19 20 78
C350: E4 FF F0 FB C9 20 F0 F7 F4
C358: D0 EB 20 E7 FF 4C C0 C2 EC
C360: A9 20 20 D2 FF CA D0 F8 B1
C368: 60 A2 02 BD 1D CA 9D 02 B2
C370: CA CA 10 F7 AE BD CC A0 E7
C378: 00 BD 22 CA 29 7F 99 05 6A
C380: CA C8 E8 BD 22 CA 30 05 DC
C388: 99 05 CA D0 F4 A9 0D 99 08
C390: 05 CA 8E BD CC 60 A0 07 81
C398: B9 74 CA 8C C6 CC AA 20 7C
C3A0: C6 C3 A9 00 8D C5 CC 20 15
C3A8: 45 C3 AC C6 CC 88 10 E8 73
C3B0: 60 48 AD C5 CC D0 0D A9 21
C3B8: 20 20 D2 FF A9 22 8D C5 EA
C3C0: CC 20 D2 FF 68 60 8E C0 98
C3C8: CC 20 54 C4 B0 27 AE C0 16
C3D0: CC BD 00 CE F0 EF A0 00 AB
C3D8: BD 03 CE F0 19 C9 A0 F0 CD
C3E0: 15 20 B1 C3 C8 C0 11 90 B6
C3E8: 03 88 D0 0A 20 D2 FF EE 31
C3F0: BF CC E8 D0 E3 60 AD BF E8
C3F8: CC F0 FA A9 22 20 D2 FF 70
C400: A9 00 8D BF CC 84 B7 8C 8C
C408: C8 CC A9 11 E5 B7 F0 04 EA
C410: AA 20 60 C3 AE C0 CC BD F8
C418: 00 CE 20 93 C4 AC C0 CC 99
C420: B9 1C CE AA B9 1D CE A0 B5
C428: 20 8C C4 CC A0 05 8C 13 AB
C430: C9 20 0C C9 A9 20 20 D2 AC
C438: FF A0 00 8C B8 CC 8C 3D B4
C440: CA A2 30 8E C4 CC 8D 3D C8
C448: CA 20 CD C6 A9 20 8D C4 E3
C450: CC 4C 89 C6 AD 02 02 C9 35
C458: 3A D0 19 A0 00 AE C0 CC 59
C460: B9 03 02 F0 23 C9 3F F0 2D
C468: 0D C9 2A F0 07 DD 03 CE 11
C470: F0 0D 38 60 18 60 BD 03 40
C478: CE F0 F7 C9 A0 F0 F3 E8 68
C480: C8 CC CA C9 90 DA F0 D8 DF
C488: BD 03 CE F0 E7 C9 A0 F0 4C
C490: E3 38 60 48 A8 F0 0C 29 24
C498: 80 F0 0B 98 29 40 F0 03 0B
C4A0: A9 3E 2C A9 20 2C A9 2A 7E
C4A8: 20 D2 FF 68 29 0F 18 F0 45
C4B0: 10 C9 01 F0 10 C9 02 F0 49
C4B8: 10 C9 03 F0 10 A9 A1 B0 92
C4C0: 0E A9 A6 90 0A A9 B0 B0 C4
C4C8: 06 A9 AB B0 02 A9 B5 A0 D6
C4D0: CA 4C 65 C6 20 0A C1 A6 A6
C4D8: 2B A4 2C 86 C3 84 C4 AD 16
C4E0: BE CC C9 25 D0 03 A9 01 D9
C4E8: 2C A9 00 85 B9 A9 00 20 C7
C4F0: D5 FF AD BE CC C9 25 F0 DF
C4F8: 3B 86 AE 84 AF A5 AF 85 78
C500: 2E A5 AE 85 2D 20 59 A6 55
C508: 20 33 A5 AD BE CC C9 2F 33
C510: F0 22 A9 01 8D B3 CC 20 FB
C518: 47 C1 A9 00 8D B3 CC AD 86
C520: B5 CC 29 0F D0 11 A9 00 66
C528: 20 90 FF 20 3B C6 20 8E A9
C530: A6 4C AE A7 4C 47 C1 4C 1B
C538: 4F C6 20 0A C1 AD C9 CC 7E
C540: C9 30 F0 0A A9 0D A0 CC 59
C548: 20 65 C6 4C 47 C1 20 59 63
C550: E1 A5 90 F0 07 C9 40 F0 5B
C558: 03 4C 68 C5 CE C8 CC CE 09
C560: C8 CC 20 9F C6 4C 47 C1 D1
C568: A9 94 A0 C9 20 65 C6 4C A9
C570: 4A C1 A0 00 A2 01 BD 00 7E
C578: 02 F0 28 C9 3A D0 0B E8 5C
C580: BD 00 02 D0 05 CA 8A A8 14
C588: D0 19 C9 22 F0 05 9D C8 BA
C590: CC D0 EC E8 BD 00 02 F0 B4
C598: 0A C9 22 F0 06 99 C9 CC B5
C5A0: C8 D0 F0 84 B7 8C C8 CC 89
C5A8: A9 C9 85 BB A9 CC 85 BC 16
C5B0: 60 A9 0D 4C A8 FF 20 E7 C4
C5B8: FF A9 7C A0 CA 4C 05 C1 5D
C5C0: A9 0F AE C7 CC A0 6F 20 EC
C5C8: BA FF A9 00 20 BD FF 20 2B
C5D0: C0 FF AD C7 CC 20 B1 FF A5
C5D8: A5 B9 20 93 FF A9 02 AE 46
C5E0: C7 CC A0 02 20 BA FF A9 9C
C5E8: 01 A2 AD A0 C9 20 BD FF 82
C5F0: 20 C0 FF A2 0F 20 C9 FF 6D
C5F8: A2 07 BD 09 CA 20 CA F1 11
C600: CA 10 F7 20 CC FF A2 0F 71
C608: 20 C9 FF A9 32 8D FC C9 22
C610: A2 00 BD FB C9 30 06 20 8C
C618: CA F1 E8 D0 F5 A2 02 20 49
C620: C9 FF A2 00 BD 00 CF 20 3A
C628: CA F1 E8 D0 F7 20 CC FF 83
C630: A9 02 20 C3 FF 20 00 C9 A9
C638: 4C 4A C1 A2 02 BD AB E3 82
C640: 95 7C CA 10 F8 A9 A1 A0 12
C648: CC 4C 65 C6 20 3B C6 A9 59
C650: 00 8D B6 CC 9D 00 02 9D 9E
C658: C9 CC E8 E0 59 90 F5 20 B8
C660: 59 A6 4C 86 E3 84 15 85 36
C668: 14 A0 00 B1 14 F0 21 C9 BE
C670: 8D F0 18 C9 C4 F0 14 C9 64
C678: D9 F0 10 C9 D4 F0 0C C9 B8
C680: FF F0 0D 20 D2 FF C8 D0 0B
C688: E2 A9 0D 29 7F 20 D2 FF BD
C690: A9 00 60 20 35 C7 20 0C E3
C698: C8 20 B1 C7 4C 4D C8 20 7D
C6A0: 8B C1 AE BB CC AD 0B DC BA
C6A8: 20 C9 C6 E8 AD 0A DC 20 F6
C6B0: C9 C6 E8 A0 00 B9 D0 C9 1F
C6B8: 20 C9 C6 C8 E8 B9 D0 C9 6F
C6C0: 20 C9 C6 AD 08 DC 4C C0 11
C6C8: C5 9D 16 CF 60 AC C0 CC AC
```

```
C6D0: B9 16 CE F0 27 10 04 18 B3
C6D8: 20 91 C8 A2 3A 20 03 C7 1B
C6E0: C8 A2 20 B9 16 CE 20 03 2E
C6E8: C7 A2 2F C8 B9 16 CE 20 0A
C6F0: 03 C7 C8 A2 00 B9 16 CE C5
C6F8: 20 03 C7 60 A9 01 A0 CC 5C
C700: 4C 65 C6 48 20 10 C7 68 21
C708: 20 14 C7 8A F0 ED D0 08 46
C710: 4A 4A 4A 4A 29 0F 09 30 AA
C718: 4C D2 FF AD 0B DC 10 04 E0
C720: 18 20 91 C8 A2 3A 20 03 B2
C728: C7 A2 20 AD 0A DC 20 03 6A
C730: C7 AD 08 DC 60 A9 D6 A0 0C
C738: C9 20 65 C6 20 1B C7 A0 F1
C740: CA A9 BA 20 65 C6 20 CF AB
C748: FF C9 0D D0 03 68 68 60 24
C750: C9 41 F0 06 C9 50 F0 05 62
C758: D0 DB A9 00 2C A9 80 8D 92
C760: CF C9 A0 CA A9 D5 20 65 6A
C768: C6 20 CF FF F0 FB C9 30 06
C770: 90 F0 C9 33 B0 EC 8D CB E5
C778: C9 20 CF FF F0 FB C9 30 19
C780: 90 E0 C9 3A B0 DC 8D CC DD
C788: C9 A0 CA A9 EF 20 65 C6 A3
C790: 20 CF FF F0 FB C9 30 90 F7
C798: F0 C9 36 B0 EC 8D CD C9 4C
C7A0: 20 CF FF F0 FB C9 30 90 08
C7A8: E0 C9 3A B0 DC 8D CE C9 41
C7B0: 60 A0 CB A9 09 20 65 C6 7C
C7B8: 20 CF FF F0 FB C9 30 90 20
C7C0: 4A C9 32 B0 46 8D D2 C9 28
C7C8: 8D E1 C9 20 CF FF F0 FB DE
C7D0: C9 30 90 DD C9 33 B0 D9 C0
C7D8: 8D D3 C9 8D E2 C9 A0 CB AA
C7E0: A9 23 20 65 C6 20 CF FF E9
C7E8: F0 FB C9 30 90 F0 C9 34 4F
C7F0: B0 EC 8D D4 C9 8D E4 C9 F6
C7F8: 20 CF FF F0 FB C9 30 90 60
C800: DD C9 3A B0 D9 8D D5 C9 99
C808: 8D E5 C9 60 18 AD CB C9 01
C810: 20 8D C8 18 20 87 C8 8D 9C
C818: BE CC AD CC C9 20 8D C8 5E
C820: 18 6D BE CC 6D CF C9 8D C5
C828: 0B DC AD CD C9 20 8D C8 CB
C830: 18 20 87 C8 8D BE CC AD 7F
C838: CE C9 20 8D C8 18 6D BE 8B
C840: CC 8D 0A DC A9 00 8D 09 C1
C848: DC 8D 08 DC 60 18 AD D2 90
C850: C9 20 8D C8 18 20 87 C8 19
C858: 8D BE CC AD D3 C9 20 8D 6A
C860: C8 18 6D BE CC 8D D0 C9 62
C868: AD D4 C9 20 8D C8 18 20 63
C870: 87 C8 8D BE CC AD D5 C9 27
C878: 20 8D C8 18 6D BE CC 8D 8D
C880: D1 C9 A9 93 4C D2 FF 18 90
C888: 0A 0A 0A 0A 60 38 E9 30 63
C890: 60 29 7F F8 69 12 D8 60 47
C898: 20 E7 FF 20 0A C1 A9 0F 45
C8A0: AE C7 CC A8 20 BA FF A9 11
C8A8: 00 20 BD FF 20 C0 FF A9 11
C8B0: 02 AE C7 CC A8 20 BA FF 79
C8B8: A9 01 A2 AD A0 C9 20 BD FB
C8C0: FF 20 C0 FF A2 0F 20 C9 3D
C8C8: FF A9 31 8D FC C9 A2 00 9A
C8D0: BD FB C9 C9 0D F0 06 20 42
C8D8: CA F1 E8 D0 F3 20 CA F1 20
C8E0: 20 CC FF A2 02 20 C6 FF 59
C8E8: A2 00 20 A5 FF 9D 00 CE BD
C8F0: 9D 00 CF E8 E0 00 D0 F2 EB
C8F8: 8E BC CC A9 02 20 C3 FF A0
C900: 20 E7 FF AD BA CC F0 03 31
C908: 4C 75 C9 60 8D C2 CC 8E 9F
C910: C1 CC A2 09 8E C3 CC A0 0A
C918: B0 AD C1 CC DD 9C C9 AD F6
C920: C2 CC FD 9D C9 90 0F 8D 42
C928: C2 CC AD C1 CC FD 9C C9 58
C930: 8D C1 CC C8 D0 E3 98 CA 2D
C938: F0 11 C9 B0 F0 03 8D C3 F9
C940: CC 2C C3 CC 30 05 AD C4 71
C948: CC F0 1F 29 7F 8E B9 CC E2
C950: AE 3D CA D0 0F AE B8 CC 1B
C958: 9D 23 CD E8 8E B8 CC AE 92
C960: B9 CC 10 06 AE B9 CC 20 52
C968: D2 FF CA 10 AA 60 A0 CB 8D
C970: A9 3D 4C 65 C6 A9 82 AE AA
C978: BA CC A0 60 20 BA FF A9 85
C980: 00 20 BD FF 20 C0 FF A2 E1
C988: 82 20 C9 FF C9 05 D0 03 97
C990: 4C B6 C5 60 41 42 4F 52 DE
C998: 54 45 44 0D 00 01 00 0A 8E
C9A0: 00 64 00 E8 03 10 27 5E 86
C9A8: 2F 25 40 5F 21 23 24 30 35
C9B0: 3A 3C 3E 4C 28 C0 08 0D AF
C9B8: 44 49 53 4B 3A 20 FF 0D 4C
C9C0: 44 49 53 4B 2D 28 38 29 A3
C9C8: 3A FF 00 30 33 30 36 00 CC
C9D0: 01 17 30 31 31 37 0D 54 14
C9D8: 4F 44 41 59 20 49 53 3A FD
C9E0: 20 30 31 2F 31 37 20 20 3A
C9E8: 20 20 20 20 43 55 52 52 A6
C9F0: 45 4E 54 20 54 49 4D 45 29
C9F8: 3A 20 00 55 31 3A 32 20 66
CA00: 30 20 31 38 20 31 31 0D 49
CA08: FF 0D 30 20 32 3A 50 2D 4F
CA10: 42 D3 C4 D3 C4 D3 C4 9D B9
CA18: C0 39 C5 7E C0 31 38 20 A0
CA20: 30 0D B1 B4 B7 B1 30 B1 0F
CA28: 33 B1 36 B2 B5 B8 B1 31 47
CA30: B1 34 B1 37 B3 B6 B9 B1 D4
CA38: 32 B1 35 B1 38 01 20 44 A0
CA40: 4F 53 20 56 45 52 2E 3D 5C
CA48: 20 20 0D 46 49 4C 45 4E 05
CA50: 41 4D 45 20 20 20 20 20 C4
CA58: 20 20 20 20 20 20 20 00 39
CA60: 54 59 50 20 42 4C 4B 20 78
CA68: 4C 41 53 54 20 55 50 44 A7
```

IMPORTANT! Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 105 and 106 explain these codes and provide other essential information on entering ***Ahoy!*** programs. Refer to these pages **before** entering any programs!

```
CA70: 41 54 45 8D E2 C2 A2 82 A3
CA78: 62 42 22 02 0D 44 45 56 2E
CA80: 49 43 45 20 49 53 20 4F 7E
CA88: 46 46 4C 49 4E 45 20 4F AD
CA90: 52 20 49 53 20 4E 4F 54 B1
CA98: 20 50 52 45 53 45 4E 54 DB
CAA0: 00 52 45 4C 20 FF 44 45 2E
CAA8: 4C 20 FF 50 52 47 20 FF 1F
CAB0: 53 45 51 20 FF 55 53 52 B5
CAB8: 20 FF 0D 0D 41 4D 20 4F F0
CAC0: 52 20 50 4D 20 20 20 20 51
CAC8: 20 20 20 28 41 2F 50 2F 41
CAD0: 43 52 29 20 00 0D 43 55 55
CAD8: 52 52 45 4E 54 20 48 4F 1D
CAE0: 55 52 53 20 20 20 28 30 94
CAE8: 31 2D 31 32 29 20 00 0D 01
CAF0: 43 55 52 52 45 4E 54 20 36
CAF8: 4D 49 4E 55 54 45 53 20 40
CB00: 28 30 30 2D 35 39 29 20 6D
CB08: 00 0D 43 55 52 52 45 4E E5
CB10: 54 20 4D 4F 4E 54 48 20 2C
CB18: 20 20 28 30 31 2D 31 32 72
CB20: 29 20 00 0D 43 55 52 52 B3
CB28: 45 4E 54 20 44 41 59 20 2F
CB30: 20 20 20 20 28 30 31 2D 67
CB38: 33 31 29 20 00 0D 20 20 33
CB40: 2D 2A 2D 20 41 48 4F 59 17
CB48: 21 27 53 20 43 48 52 4F 31
CB50: 4E 4F 2D 57 45 44 47 45 88
CB58: 20 56 45 52 20 31 2E 30 16
CB60: 20 2D 2A 2D 0D 00 93 53 F8
CB68: 59 53 54 45 4D 20 45 52 B3
CB70: 52 4F 52 3A 20 44 41 54 98
CB78: 45 2D 53 54 41 4D 50 45 B6
CB80: 52 20 43 41 4E 4E 4F 54 B7
CB88: 20 0D 4C 4F 43 41 54 45 6F
CB90: 20 46 49 4C 45 2C 20 50 6E
CB98: 4C 45 41 53 45 20 43 48 AF
CBA0: 45 43 4B 20 44 49 52 45 B9
CBA8: 43 54 4F 52 59 2E 0D 0D 83
CBB0: 00 0D 50 52 49 4E 54 45 91
CBB8: 52 20 4D 55 53 54 20 42 D7
CBC0: 45 20 34 20 4F 52 20 35 71
CBC8: 2C 20 50 4C 45 41 53 45 D0
CBD0: 20 52 45 2D 4B 45 59 2E CD
CBD8: 0D 00 0D 44 52 49 56 45 6E
CBE0: 20 4D 55 53 54 20 42 45 F2
CBE8: 20 38 20 4F 52 20 39 2C 88
CBF0: 20 50 4C 45 41 53 45 20 EC
CBF8: 52 45 2D 4B 45 59 2E 0D E2
CC00: 00 2D 2D 3A 2D 2D 20 2D 3C
CC08: 2D 2F 2D 2D 00 0D 20 20 0C
CC10: 20 20 20 46 49 4C 45 4E DF
CC18: 41 4D 45 20 4D 55 53 54 56
CC20: 20 49 4E 43 4C 55 44 45 46
CC28: 20 22 30 3A 22 20 46 4F AC
CC30: 52 0D 20 20 44 41 54 45 EE
CC38: 20 53 54 41 4D 50 45 52 76
CC40: 20 54 4F 20 57 4F 52 4B 68
CC48: 2C 20 50 4C 45 41 53 45 50
CC50: 20 52 45 2D 4B 45 59 2E 4D
CC58: 0D 00 0D 20 20 43 48 52 90
CC60: 4F 4E 4F 2D 57 45 44 47 A2
CC68: 45 20 56 31 2E 30 20 28 FB
CC70: 43 29 20 43 4F 50 59 52 8B
CC78: 49 47 48 54 20 31 39 38 68
CC80: 35 0D 0D 20 20 20 20 20 70
CC88: 20 20 20 20 20 20 20 44 AD
CC90: 45 4E 4E 59 20 4D 55 53 E1
CC98: 43 41 54 45 4C 4C 49 0D A5
CCA0: 00 0D 42 59 45 0D 00 12 AD
CCA8: 53 54 41 4D 50 49 4E 47 0E
CCB0: 3A 20 00 00 0D 30 00 00 48
CCB8: 00 00 00 00 3A 00 10 00 03
CCC0: 00 00 00 00 00 00 00 08 C8
CCC8: 00 00 00 00 00 00 00 00 C8
CCD0: 00 00 00 00 00 00 00 00 D0
CCD8: 00 00 00 00 00 00 00 00 D8
CCE0: 00 00 00 00 00 00 00 00 E0
CCE8: 00 00 00 00 00 00 00 00 E8
CCF0: 00 00 00 00 00 00 00 00 F0
CCF8: 00 00 00 00 00 00 00 00 F8
CD00: 00 00 00 00 00 00 00 00 00
CD08: 00 00 00 00 00 00 00 00 08
CD10: 00 00 00 00 00 00 00 00 10
CD18: 00 00 00 00 00 00 00 00 18
CD20: 00 00 00 00 00 00 00 00 20
CD28: 00 00 00 00 00 00 00 00 28
CD30: 00 00 00 00 00 00 00 FF 30
CD38: FF FF FF FF FF FF FF FF 38
CD40: 00 00 00 00 40
```

NOTEMAKER
FROM PAGE 51

```
·10 REM DISKETTE NOTEMAKER                      KI
·15 REM FOR AHOY! MAGAZINE                      DM
·20 REM BY TIM GERCHMEZ                         GN
·25 POKE53281,0:POKE53280,15:POKE646,1          BF
·30 PRINT"[CLEAR][DOWN][8" "]DISKETTE NOT
E CREATOR[DOWN][DOWN]"                          NO
·35 PRINT"YOU CAN USE THE WHOLE SCREEN AS
 A "                                            LG
·40 PRINT"SCRIBBLING PAD. (EXCEPT THE TOP
MOST "                                          IN
·45 PRINT"AND BOTTOMMOST LINE)."                KG
·50 PRINT:PRINT"PRESS RETURN WHEN DONE."        PP
·55 PRINT"PRESS SHIFT-RETURN IF YOU WANT
TO"                                             DI
·60 PRINT"ADVANCE THE CURSOR TO THE NEXT
LINE."                                          OG
```

```
•62 PRINT:PRINT"THE CURSOR COLOR IN USE W
 HEN RETURN IS"                            DG
•63 PRINT"PRESSED WILL BE THE ONE USED WI
 TH THE":PRINT"NOTEFILE."                  MJ
•64 PRINT:PRINT"YOU LOAD THE NOTEFILE WIT
 H A ,8,1"                                 DM
•65 PRINT:INPUT"FILENAME";FI$:FI$=FI$+".N
 ":PRINT:PRINT"PRESS RETURN TO START."     HO
•70 POKE198,0                              KB
•75 GETA$:IFA$=""THEN75                    GH
•80 PRINT"[CLEAR]";:SYS65487               GO
•85 OPEN15,8,15,"I0":PRINT#15,"S0:"FI$     MM
•90 CLOSE15:OPEN2,8,2,FI$+",P,W"           JD
•95 PRINT#2,CHR$(0)CHR$(1);                OF
•100 FORT=256TO514:CT=T:PRINT#2,CHR$(2);:
 NEXT                                      LE
•105 READA:IFA=256THEN115                  HJ
•110 CT=CT+1:PRINT#2,CHR$(A);:GOTO105      HM
•115 CT=CT+1:IFCT<2040THENPRINT#2,CHR$(PE
 EK(CT));:GOTO115                          JK
•120 CLOSE2                                NC
•125 PRINT"[CLEAR][DOWN][DOWN]DONE."       PD
•130 PRINT:PRINT"ANOTHER FILE (Y/N)":POKE
 198,0                                     LB
•135 GETA$:IFA$=""THEN135                  HO
•140 IFA$="Y"THENRUN                       IK
•145 IFA$="N"THENSYS2048                   FF
•150 GOTO 135                              CH
•1000 DATA160,0,173,134,2,153,0,216,153,0
 ,217,153,0,218,153,0,219                  PM
•1005 DATA200,208,241,169,19,32,210,255,7
 6,116,164,256                             LB
```

FLANKSPEED LISTING CREATOR
FROM PAGE 51

```
•5 POKE53280,12:POKE53281,11               LL
•6 PRINT"[CLEAR][c 8][RVSON][7" "]FLANKSP
 EED LISTING CREATOR[7" "]";               JD
•10 PRINT"[RVSON] CONVERTS MEMORY TO FLAN
 KSPEED LISTING  "                         CN
•15 PRINT"[9" "]CREATED BY G. F. WHEAT[9"
 "]"                                       AD
•20 PRINT"[RVSON][3" "]COPR. 1986, ION IN
 TERNATIONAL INC.[3" "]"                   CJ
•40 PRINT:INPUT"PROGRAM NAME";C$           GH
•50 PRINT:INPUT"SYS TO START IN DECIMAL";
 D$                                        KI
•80 B$="STARTING BYTE OF ML IN HEX":GOSUB
 2010:AD=B                                 IK
•85 GOSUB2520:IFB=0THEN80                  FO
•90 B$="LAST BYTE OF ML IN HEX":GOSUB2010
 :EN=B                                     EM
•95 GOSUB2510:IFB=0THEN80                  FP
•100 OPEN4,4:PRINT#4,"PROG NAME: ";C$:PRI
 NT#4                                      HF
•110 AC=AD:GOSUB3010:PRINT#4,"STARTING AD
 DRESS: "B$:PRINT#4                        IB
•120 AC=EN:GOSUB3010:PRINT#4,"ENDING ADDR
 ESS: "B$:PRINT#4                          PJ
•125 PRINT#4,"SYS TO START: "D$:PRINT#4    IA
•130 AC=AD:GOSUB3010:C$=B$+": ":CK=AD-(IN
 T(AD/256)*256)                            KC
•140 FORB=0TO7:AC=PEEK(AD+B):CK=CK+AC:IFC
 K>255THENCK=CK-255                        IN
•150 GOSUB3030:C$=C$+B$+" ":IFAD+B=ENTHEN
 500                                       HE
•160 NEXTB:AC=CK:GOSUB3030:C$=C$+B$        PI
•170 PRINT#4,C$:AD=AD+8:GOTO130            ME
•500 AC=CK:GOSUB3030:C$=C$+B$:PRINT#4,C$   PC
•600 CLOSE4:END                            JD
•2000 REM GET FOUR DIGIT HEX               PC
•2010 PRINT:PRINTB$;:INPUTT$               GM
•2020 IFLEN(T$)<>4THEN2010                 EB
•2040 FORA=1TO4:A$=MID$(T$,A,1):GOSUB2060
 :IFT(A)=16THEN2010                        KH
•2050 NEXT:B=(T(1)*4096)+(T(2)*256)+(T(3)
 *16)+T(4):RETURN                          GF
•2060 IFA$>"@"ANDA$<"G"THENT(A)=ASC(A$)-5
 5:RETURN                                  EH
•2070 IFA$>"/"ANDA$<":"THENT(A)=ASC(A$)-4
 8:RETURN                                  KP
•2080 T(A)=16:RETURN                       NP
•2500 REM ADRESS CHECK                     LI
•2510 IFAD>ENTHENB=0:RETURN                PK
•2520 IFB<256OR(B>4096ANDB<49152)ORB>532
 47THENB=0                                 AP
•2530 RETURN                               IM
•3000 REM ADDRESS TO HEX                   EB
•3010 B$="":A=4096:GOSUB3070               PJ
•3020 A=256:GOSUB3070:GOTO3035             NB
•3030 B$=""                                FO
•3035 A=16:GOSUB3070                       PN
•3040 A=1:GOTO3070                         LN
•3060 RETURN                               IM
•3070 T=INT(AC/A):IFT>9THENA$=CHR$(T+55):
 GOTO3090                                  CJ
•3080 A$=CHR$(T+48)                        JP
•3090 B$=B$+A$:AC=AC-A*T:RETURN            EG
```

SCUTTLEBUTT

Continued from page 96

in memory, uses every C-128 key, and includes a function key-accessible page up/page down feature. A video display of 80, 160, or 320 columns can be selected.

HomePak ($49.95) now includes punter protocol for communication with Commodore bulletin boards.

The Consultant ($59.95) for the 128 utilizes the 128's extra keys to perform certain functions, and can be automatically booted on power-up.

Batteries Included, 416-881-9941 (see address list, this page).

TAX/MONEY MANAGERS

The 1986 edition of *J.K. Lasser's Your Income Tax* ($69.95) for the C-64 includes 28 forms and schedules, an "interactive interview" that selects the proper ones for the user, and a copy of the guidebook of the same name. Included is a worksheet feature for performing computations, taking notes, and listing information.

The program allows individuals to move back and forth between 1040 line numbers and related forms and schedules. All screen-displayed forms and schedules match the official IRS forms; the program also prints out IRS-accepted forms and schedules.

J.K. Lasser continues nosing into your personal financial affairs with *J.K. Lasser's Your Money Manager* ($69.95), a home accounting/small business tool providing a check writer, financial statements, balance sheets, budget reports, and other essentials for financial planning.

Simon & Schuster Computer Software, 212-245-6400 (see address list, this page).

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AC3L Software
P.O. Box 7
New Derry, PA 15671

Accolade Inc.
20863 Stevens Creek Boulevard
Cupertino, CA 95014
Phone: 408-446-5757

Access Software
2561 South 1560 West
Woods Cross, UT 84087
Phone: 801-298-9077

American People/Link
3215 North Frontage Road, Suite 1505
Arlington Heights, IL 60004
Phone: 800-524-0100; in IL 312-870-5200

Batteries Included
30 Mural Street
Richmond Hill, Ontario
L4B 1B5 Canada
Phone: 416-881-9941

Berkeley Software
2150 Shattuck Avenue
Berkeley, CA 94704
Phone: 415-644-0883

Brown Boxes, Inc.
26 Concord Road
Bedford, MA 01730
Phone: 617-275-0090

Cardco, Inc.
300 S. Topeka
Wichita, KS 67202

Covox Inc.
675-D Conger Street
Eugene, OR 97402
Phone: 503-342-1271

Epyx, Inc.
1043 Kiel Court
Sunnyvale, CA 94089
Phone: 408-745-0700

Ergo Systems, Inc.
303-3 Convention Way
Redwood City, CA 94063
Phone: 415-363-5966

Fuji Photo Film U.S.A., Inc.
350 Fifth Avenue
New York, NY 10118
Phone: 212-736-3335

IHT Software
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San Francisco, CA 94123
Phone: 415-441-1607

Learning Technologies
4255 LBJ, Suite 265
Dallas, TX 75244
Phone: 214-385-2351

Maxtron
1825A Durfee Avenue
South El Monte, CA 91733
Phone: 818-350-5707

Microcomscribe
8982 Stimson Ct.
San Diego, CA 92129

MicroProse Simulation Software
120 Lakefront Drive
Hunt Valley, MD 21030
Phone: 301-667-1151

Multibotics, Inc.
2561 South 1560 West
Woods Cross, UT 84087
Phone: 801-298-9079

Nth Digit Solutions
3243 Arlington Avenue, No. 195
Riverside, CA 92506

Progressive Peripherals and Software
464 Kalamath Street
Denver, CO 80204
Phone: 303-825-4144

Scott, Foresman and Company
1900 East Lake Avenue
Glenview, IL 60025
Phone: 312-729-3000

ShareData, Inc.
7122 Shady Oak Road
Eden Prairie, MN 55344
Phone: 800-328-6061 or 612-829-0409

Simon & Schuster
1230 Avenue of the Americas
New York, NY 10020
Phone: 212-245-6400

Smoky Mountain Software
P.O. Box 1710
Brevard, NC 28712
Phone: 704-885-2516

Springboard Software, Inc.
7808 Creekridge Circle
Minneapolis, MN 55435

SubLOGIC Corporation
713 Edgebrook Drive
Champaign, IL 61820
Phone: 217-359-8482; orders 800-637-4983 except in IL, AK, HI

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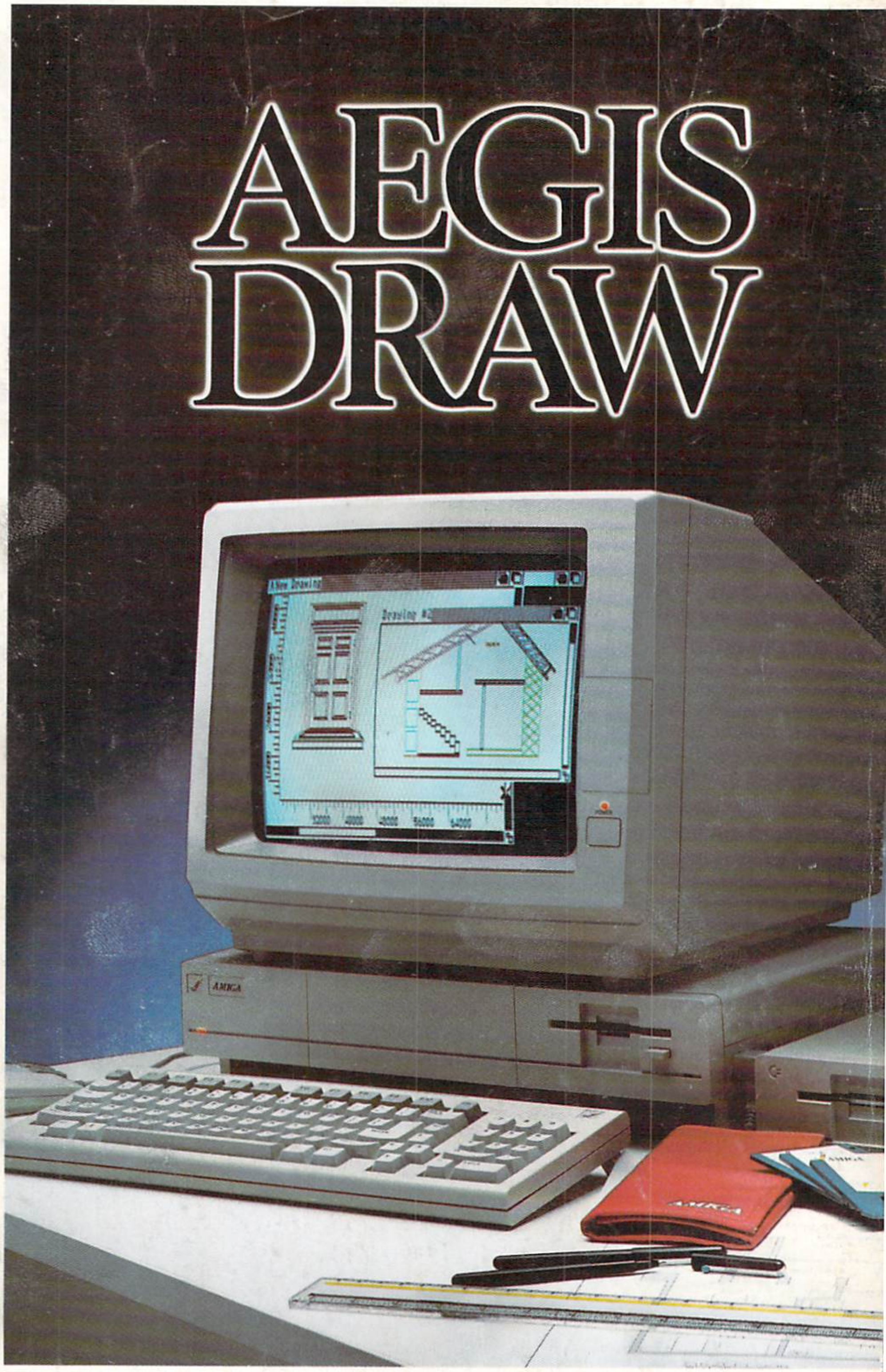
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